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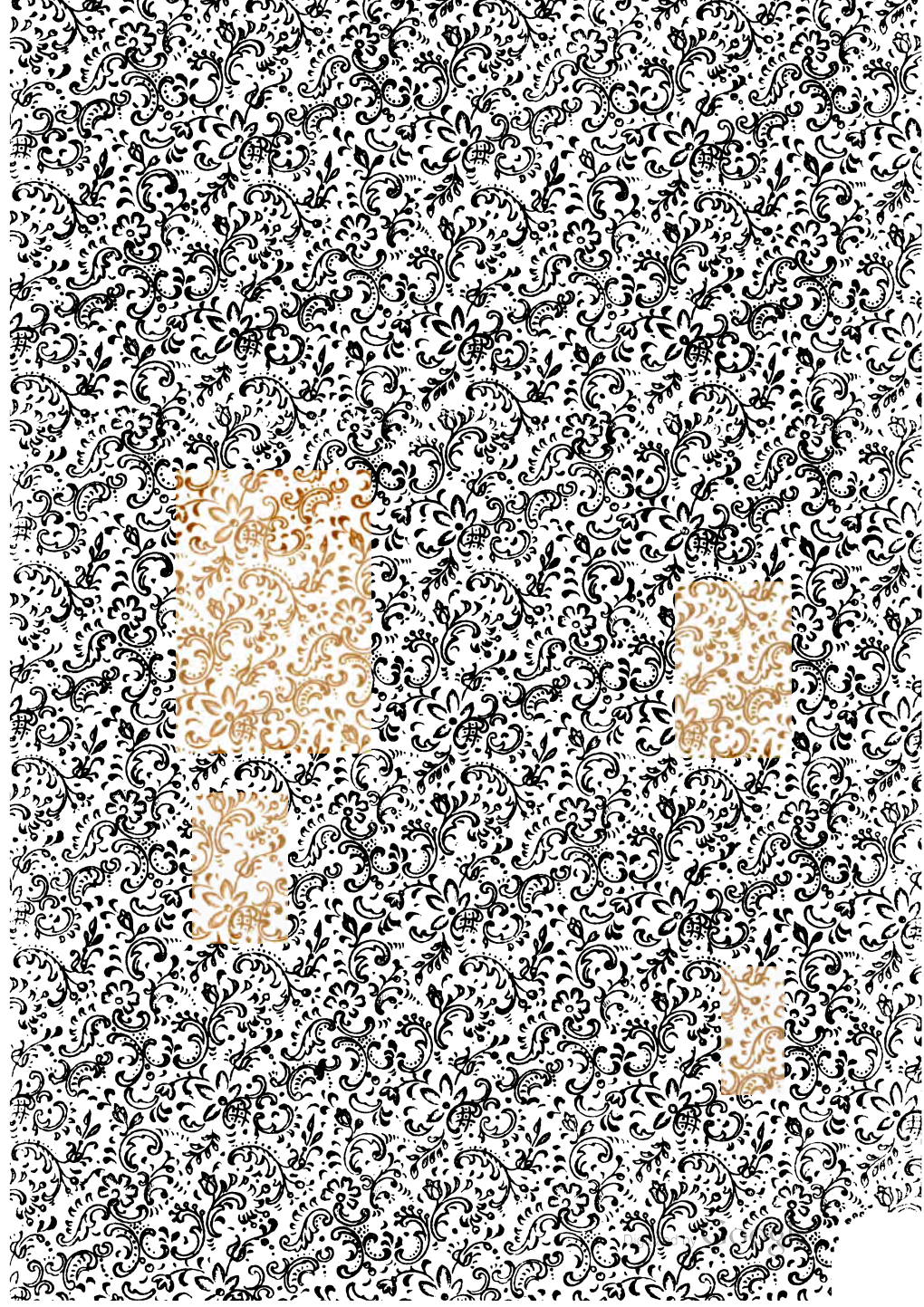
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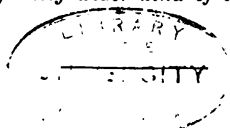
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AN
ENGINEERING STUDENT'S
NOTES

Technical, Philosophical
and Otherwise

BY J. RICHARDS

*"The true epic of our time is not arms and the man, but tools
and the man, an infinitely wider kind of epic."—Carlyle.*



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PREFACE.

The subject matter that makes up most of the present book was written between the years 1890 and 1897, and published in the Magazine "*Industry*," of which publication the writer was the editor during that period.

The title assumed at that time was "EXTRACTS FROM A NOTE BOOK—BY TECHNO," began and for some time continued as a means of instructing students and apprentices in the processes of engineering work by a half-humorous treatment that would divest the subject of its usual formal and dry presentment in technical books.

The articles met with much commendation, but it was found after five or six chapters had been prepared that the field was too circumscribed, and that the "Extracts" must extend into the outer world and change their form, or cease. A new scheme was adopted in the sixth article, where the present revision begins, omitting, with a few exceptions, so much as would fail to have interest for non-technical readers.

J. R.

San Francisco, July, 1904.

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AN ENGINEERING STUDENT'S NOTES.

CHAPTER I.

CORRUGATED WATER—GETTING STRUCK—STEAM STEERING
GEAR—A CASE OF FRICTION—SEA SICKNESS—
THE COPERNICAN SYSTEM.

—————The writer, an “Improver” in an Engineering Office and Works, had for a number of years been climbing with commendable effort the long ladder that leads up to an evanishing proficiency in an art that has no ending. His eyesight, digestion and spinal stability had to an extent been sacrificed on the altar of effort, when he discovered that no art or profession is worth much if learned in the “abstract,” and that really useful knowledge of anything must include the “concrete.”

We are at this day continually reminded that knowledge of the applied arts must be specialized, which is true if we consider men as machines, and in modern practice a great share of them have to be so considered and employed, but another portion must be more than this. They must be thinking factors, comparing and analyzing all around their immediate work, otherwise there can be but little progress made.

This was to me an agreeable revelation, accepted at once at full value, and fortunately circumstances permitted an experiment which furnishes subject matter for these notes.

—————An uncle of mine, a marine engineer, an eccentric but able man in his calling, and in many other ways as will appear, sent word that he was to “stop ashore” for some months, and invited me to “go over” with him on the next trip out and have a “look around.”

The “over” meant to cross the Atlantic Ocean and the “look around,” I inferred from his letter, meant a trip around work shops, ship yards, and so on, in Europe. My delight at this may be imagined.

My uncle is a salt water engineer, commonly taciturn and positive, with a good deal of eccentricity in his make-up—a mechanical agnostic, in so far as new inventions; certain of his opinions which embrace a world of subjects, and detests argument.

I got leave of absence, and after a week of events that have no interest here, I found myself on a North Atlantic “liner” with my uncle, who went out as a passenger to, as he said, “see how it felt.”

After twenty-four hours out things settled down and I hunted up my note book, and here is my first entry :

—————In the smoking-room last night, where my uncle spends most of his time, he was asked how high sea waves rose in a storm. “Don’t rise at all,” said he, “A landsman’s idea. They are blown off. People think waves are made like corrugated iron to a regular pitch. Best description I ever heard was from a child who said in time of a storm, ‘the sea is all torn up.’ In a gale of wind there is some regularity of waves; in a storm, none. You may be ‘struck’ once an hour, once a day, or not at all. Next, you will ask: What is being ‘struck’? I anticipate you and say I do not know. Railings, davits, boats and deck houses gone. That’s being

'struck.' Better learn it by precept if you can, the example is not attractive."

————— I blundered on the steam steering gearing today, in an iron house on the main deck, and found enough to make a note of. The Mechanical Professor gave us quite a lecture on this subject one time, but then we scarcely knew what steering meant, or whether it required ten pounds or a thousand to move the rudder; it was then difficult to understand much about steam steering, but I am at the "bottom of it now."

One thing I do not understand and can get no light upon is this: If a ship is lying still and the extreme of the rudder is fastened to some stationary object it requires five times as much force to swing the ship as it would if she were under way. The movement through the water has to do with this.

The Professor explained, and showed us at college, how a close-fitting shaft, while being passed through a hole, could be turned with the hands while it was moving endwise, but could not be budged with a lever if the end movement ceased. It seems to be the same way in steering a ship or boat, but I am forgetting the steam gear.

There are a great many modifications, but only two types, so far as I can find out. One, wherein there are a pair of small engines connected at right angles and the eccentrics turned by the small steering wheel. Of course the engines follow the eccentrics, whether they may be turned right or left, so the labor on the wheel is no more than moving the valves, but even this is too much for our day, and the whole is steam controlled on large ships; the "wheel" has only to indicate. The reversing is done by changing the induction to the exhaust, and the

degree of movement is regulated by an "overtake" valve, that follows up and closes at any point.

This may be clear, but I doubt it; however any one who wants to know more can use this as a clue and look the matter up for themselves. Our steering gearing is of the old simple kind, the tiller wheel connected to the eccentrics; anybody can understand that.

—————Some remarks of my uncle last evening, "anent" friction, as Tweed, the Scotchman, would say, called to mind a little experience of my own that will do for a note here.

When out on the Pacific Coast, some time ago, I made frequent trips on a particularly nice steamboat called the *San Rafael*. She was built on the model of the old Staten Island boats at New York, before the present huge boats were put on, and was a clean cut specimen of the best beam engine practice. She steamed at the rate of fourteen to sixteen miles an hour, in regular service, on her seven mile runs.

Mr. Jones, the engineer, an old North River man, is an adept on beam engines, who more than anyone else I have ever met understands the "genesis," "thesis," and all besides of this type of "steam machines." I was in his engine room one day, just as we were to leave a landing, when he glanced at the indicator and saw the engine was dead on the center!

Mr. Jones called down to the fire room, "Tom, come up and turn the wheel off the center." I watched for Tom expecting to see him emerge with a hydraulic jack, a set of chain tackle, or at least a pinch bar, but he had nothing of the kind. He walked over to the port wheel, opened a door, set one foot on a float, caught one above with his hand, and turned that 800 horse power engine

10 degrees with not more than 160 pounds weight on the wheel. I never was so much astonished in my life, and expect the reader to be the same—but it is true. It is a pretty tough story, but can be demonstrated at any time by going out to San Francisco, and it is well worth a journey there to see it, if there are no examples nearer home.

“You see,” said Mr. Jones, “this keying up, setting out springs and general tension on things is a humbug. A skilled man keeps his engine slack and at the same time without play. Why that piston is as tight as a cork in a bottle and still is hanging loose in the cylinder. I have two springs opposite the steam ports blocked with wood to keep the inrush of the steam from pushing the piston over to the other side. I can open one of those exhaust valves and that vacuum will stand there for half an hour!”

I am going to read this note to my uncle, and write some of his remarks, unless they are too explosive for this modest collection of notes.

————— I have escaped sea-sickness, and had the pleasure of listening to a lecture on this subject by my uncle, delivered last evening in the smoking-room, in substance thus: “Sea-sickness is a mental malady, in a sense; that is, it can be cured mentally. I have seen a whole mess of sea-sick persons cured in one minute by an alarm of fire. Sometimes ladies are cured by a steward spilling the soup in their laps. I have several times seen people fall over the rail when ‘heaving up’ and when we fished them out of the water no trace of the complaint remained. It is no laughing matter though—not in any sense.

"The claim that it is good for general health is a humbug—a gross humbug. An emetic is a good thing in this time of ours when everyone eats like a cormorant, and that far sea-sickness may do some good. Prevent it, you say! Well, in the first place, have nothing to do with doctors or their nostrums. Sea-sickness is not always alike, but generally begins with acidity of the stomach, and this acidity is the result, usually, of one of two factors or both, liquids and grease. When ill, lie on your back fore and aft ship, and swallow broken ice, slowly. I don't mean at first, but after a few hours when the stomach is sure to be inflamed and hot, while your hands and feet will be cold. When you get the boiler, I mean stomach, cooled off and empty, well seasoned beef tea, broth, and if you can get it, cream, are suitable things to fill up on. The only medicine you need is some alkaline to correct acidity, calcined magnesia is best. For solid diet fat pork or old cheese"—just here several pale-looking passengers made for the door, and my uncle lit his pipe.

————— I never got a clear conception of the "Copernican system" until last night. We have no clear air on land. At sea on a clear night you gaze into the firmament and see the planets as spheres, see how they are set in space. The impression is wonderful. You may have a "belief" in the truths of astronomy. A clear night at sea gives you "conviction" of these truths. You are skimming along on the sea with five-eighths of an inch between you and eternity; driven by what an hour ago seemed the most wonderful of inventions. Now, gazing into the mass of whirling worlds, each moving in rhythm of course and time, this trifling little contrivance of man—a steamship—is but an insignificant atom

in this vast machinery of the Universe. This note will run into poetry if not stopped here.

CHAPTER II.

SEA ENGINES—ESSAY ON BOILERS—A VERSATILE SCOTCH-MAN—HOW TO RAISE AN OBELISK—THE LOST ARTS—BARNACLE GEESE.

—————The engines, simple compound, go on forever. The chief, who my uncle knows, has taken an interest in me and “chalked my coat,” that is, given me a pass down below. Sixty revolutions per minute of 60 inches stroke, is 600 feet of piston speed. A surface speed on the crank-pins of 300 feet a minute and no stopping to key up, for any cause. Six hundred thousand turns between ports. Seven days at 600 feet per minute of piston speed! Just think of going to a land engineer with his machinery fixed to immovable foundations, and ask him to run an engine of 8,000 horse power for seven days without slowing for a stroke; not for once, but for scores of times and continually. He could not do it, at least don’t do it. Nor can he feed such an engine with less than two pounds of coal per horse power per hour, as they do here. My uncle says: “Land engines, my boy, are not made like these. They have neither the workmanship, nor material, neither have they the care. Here are hundreds of engines in ‘similar use.’ Competition, emulation and guarantee are all wanting, or nearly so, in land engines. These are not ‘rattle trap’ machines with a score or more of pin joints to work the valves. Imagine a Corliss or Proell rig on one of those engines. The whole thing would go to

'smithereens' in a month, or at least want to. Mr. Jordan, of the Guion Line, tried Corliss valves and failed. The clatter and roar of the engine room reminded one of a shot separator. Jordan tried a good many things; built the Montana and Dakota with water tube boilers, busted the company and quit. Go down into the engine room and count up the joints and pieces. Then count up a land engine's pieces and compare. The great science of construction is to 'leave out pieces.' Marine engineers leave out pieces, land engineers hunt places to add them. It is seven bells. Time to turn in."

—————Next morning I found my uncle in a talkative mood—that is, for him, and tackled him on boilers. "Boilers," said he, "are seen at sea. On land you have kettles set in brick and burn five pounds of coal to a horse power. The place to fire a boiler is in the boiler, not alongside. You must give up this idea of outside firing for a time. You will see but little of it in Europe. I have had little to do with bricked-up boilers and want less in future. A man who wants a good boiler must pay for it; must have enough boiler to give heating surface inside, not on the outer shell. These outside boilers are an expedient of cheapness, so also are all the tribe of sectional, water tube, and all the rest. Boiler makers must supply what people want, so they are not to blame. A boiler maker must not learn too much. It makes him unhappy. He cannot carry out his ideas in land boilers. High pressure may, and has modified practice, but if I had my way I would establish by code two types of boilers—one marine and one for land, and hang every man who departed from them. Experiments in boilers have cost enough to pay the national debt of Russia, and what is the result? Except as to sustaining

higher pressures, a boiler of forty years ago is just as good as one now—perhaps better.”

—————There is a bristly old Scotchman among our passengers who seldom says anything, but when he does “open out,” as old Keyway used to call it, there generally is some fun. He seems to smoke nearly all the time, seldom reads, and how he ever gathered up the stock of information he has, is a wonder of the sixth power. He is a walking, or rather a smoking encyclopædia of the “science of things in general,” or as the Professor used to say, of *Gemeinlichwissenschaft*.

To-day we had in the smoking-room a harangue from one of those lunatics who conceive that the ancients knew all and more than we do at this day, and that their arts have been lost. “The lost arts,” he kept repeating, while old Tweed, the Scotchman, was watching him and puffing. “The great pyramids,” said the lecturer, “could not be reared in our time. The mighty agencies then brought to bear have passed away—have been lost.”

Tweed broke out upon him thus: “Are you an engineer, sir? No? Then how the deuce do you know the pyramids could not be built now? Who told you so, and how could *you* know it was true if somebody *did* tell you so? A countryman of mine, you may have heard of, Mr. Rankine, says, 450 tons of coal would lift and place all the stones in the pyramids of Egypt. He *knew* this, and you don’t *know* anything about it, and can’t, because you have no knowledge of the science of the matter. In 1856, Fontana, one of your old time engineers, raised an obelisk in Rome with 40 capstans, worked by 960 men and 75 horses. In 1878, Mr. Dixon raised Cleopatra’s Needle, in London, with four hydraulic lifting jacks, worked by four men.

“You are like a Mr. Wendel Phillips, who used to go around lecturing on the ‘Lost Arts’—making Damascus steel and the like—when he knew no more of the Arts than—you do. My friend, confine yourself to pure science; the nebulae of the planets, prehistoric man and barnacle geese, but don’t fool with arts that are computable, or anything that comes within the field of mathematics, unless you want to make an ass of yourself.” We cheered the Scotchman, and I went off to hunt up my uncle to see what Tweed meant by “barnacle geese.”

He laughed and said, “Some one has been chaffing you.” He had never heard of this kind of fowl, but next day, much to my comfort, some one asked Tweed what he meant by “barnacle geese.”

Here is his answer in “English.” I wish I could give it in his vernacular, but I might as well try to write in Sanskrit.

—————“Barnacle geese! I don’t wonder you inquire. Accounts of these are written mostly in Latin. Did you ever see a barnacle? Most people think they are a little shellfish the size of a pea, and so they may be, but they are also as big as my thumb, sometimes; housed in an open end shell, and have a beak that looks like the bill of a bird. This is where the myth began—the myth of ‘barnacle geese,’ that lasted 400 years.

“These geese grew on trees over the water, or where the water touched the branches; they came out like a blossom. When they were old enough they dropped off into the water and swam away—what are you laughing at?

“There are long essays in Latin on the nature and habits of these geese, and drawings too, showing them in different stages of their growth. They had some

peculiar mark that distinguished them, and they brought a high price in the markets of the Latin cities, as I said, for four centuries.

“Now we come to the point. The priests and the rich did not want to do without animal food during Lent. They longed for the ‘flesh-pots,’ and ate for the time ‘barnacle geese,’ which were a ‘vegetable product,’ that grew on trees. Such a myth would have disgraced the Maoris, or Hottentots. It was reserved for our immediate ancestors.”

I would have been shocked at Tweed’s remark about our ancestors if I had not just been reading some of Aristotle’s Philosophy, and also a little before, Dr. Draper’s critique of Lord Bacon’s writings on the same subject. Barnacle geese are not so much of a “stretch” after all, but it is humiliating just the same, and perhaps a wholesome lesson for the student.

CHAPTER III.

A SMELL OF ERIN—UP IN THE MAIL—AT INCHICORE—
AXLE GREASE—NEW NAMES—FLATTENED OUT—
HOW TO SEE A CHANNEL STEAMER—
A LECTURE ON IRELAND.

—————We are now nearing the land. This fact is emphasized by the “smell of turf,” as Tweed calls it. Whether it is turf or not I do not know, but certainly there is a scent of burning hay or grass away out here, sixty miles from land. Every one is on the *qui vive*; there are four hours more to Queenstown where my uncle says we are to go ashore. The lies are growing thicker as we round the Irish Coast. The man from

Wisconsin is informed that the Martello Towers are remains of ancient Celtic castles. A lady near by learns these strange little structures are where the Druids offered up human sacrifices, and much more of the kind.

We stop, not at Queenstown, but miles outside, and go ashore in a paddle-wheel tug, then go into a train, and in an hour are landed at a curious old hotel in Cork. How we got here and disposed of I do not know. My uncle is at home with everything, just as he would be in his engine room, no one takes him for a stranger. He gets what he wants with a sign or nod, fees are paid in silence, without dispute, and even the peddlers at Queenstown passed him by. I am in a maze but will "get on" by keeping a "close throttle," as my uncle says.

I verily believe that if set down in this inn and left to my own resources, I would never have got anything to eat or drink, or even a place to sleep. The language, names, and customs are all mysteries to me. We "go up in the mail" to-morrow, which means we are going to Dublin by the express train. My uncle has some business there, or at Inchicore, which is a suburb of Dublin, and promises me my first glimpse into a British machine shop.

————— I skip over the incidents of my trip on the Great Southern and Western Railway of Ireland, because I propose at some future time or place, in these notes, to describe railway travel in Europe, and from this, the first taste of it, I imagine there will be no lack of material.

On the way up from Cork my uncle in reply to some questions of mine finally broke out in a monologue as follows: "You are just like all Americans, and nearly all other people for that matter. What you know or imagine respecting Ireland comes from the pictures of

Paddy and his pig, and from peasant immigrants. Soon we will pass at Newry the first electric railway made in the United Kingdom. It is driven by water power and at the other end of this road seven miles away is the most orderly city in any English speaking land, America included. There is no whiskey, no acting peace officers even, and it stands at the top in what we are pleased to call civilization. At Dublin you will see the best conducted locomotive works in Britain; at Belfast, the best ship yard and stationery works. Irishmen command the army, are leaders at the bar, and Lord knows how many other things. The people are an anomaly, a mixture of the best and the worst, with no clue to lines of distinction. Keep your eyes open, also your ears, for in two hours more you will hear for the first time the true English language spoken.

We are now at Inchicore. My uncle is in the offices, and I in charge of a "clark" looking through the works. At first I was astonished to see what seemed a precise counterpart to one of our own works at home, and in a short time was astonished at the differences. This seems a little Irish, as a proposition, but it is true. To begin with I never before saw a railway shop in such order, so clean and neat; a place for everything and everything in its place. The men looked intelligent, and were certainly so. They worked quietly and methodically, and it was easy to see they were masters of their trade.

The amount of wrought iron parts was astonishing, scarcely a casting to be seen; the forging was of a class I had never seen before, and a result of methods to be explained presently.

The first thing to impress me was the chips, or shavings rather, because nearly all cutting was done with water and the shavings curled off in long pieces. The speed was slow, but the cuts were enormous. For short pieces, bolts and the like, slide-rests were moved by hand, and great shavings were peeled off at a rate that was never dreamed of at our little college laboratory. The sections were heavier for everything, or seemed so. The pieces in the lathes seemed to be in no case more than five diameters in length. In planing it was the same. The machines looked to me awkward but strong. There was no effort to "gig back" a carriage at a rate of 75 feet per minute, but this was more than made up as it went ahead. Nearly all tools were of the spring type, and the cutting—well, they simply took off whatever was in the way. The massive frames of tools recalls some writing on the subject, read years ago. What it is I do not know, that causes a peculiar action in any tool with a massive frame and supports, drilling machines excepted.

In passing around we came upon a large tank containing at least a ton of yellow grease. It looked good enough to eat. "That is axle grease," said my guide. "It is nearly equal parts of palm oil, and tallow, and a sixth part or so of soda. The railways here mix up their own 'grease' and call it by its true name, varying its hardness to suit the season." There is no use in trying to crowd in here one tenth of my notes, and I must have room for the "smithy," of which, next.

Here everything seems to be made in dies, even welding is done that way. Two blocks of cast iron fit together, a matrix or form being cut or cast into their faces. These dies are joined in most cases by a bow frame of

steel that springs enough to allow them to open and shut but keeps them in position to match. The blanks are put into these dies, and they are pushed under one of the large steam hammers that comes down with a crash, and the metal is moulded into form like putty. The fin, that represents the surplus, is trimmed off and the job is done. I am told there is nowhere else in the country where this method is so extensively employed as at Inchicore, and one may well believe it.

We visited the workmen's dining rooms and stores, belonging to and managed by themselves, were told how medical attendance was provided, how their food and all supplies were obtained at wholesale prices, with a hundred other things and all of them new, and this in Ireland!

—In the evening my uncle gave me a lesson on technical terms of which I make note. "Tech," said he, "mind what you call things here. It don't matter much, but what is the use of being provincial, besides you will find the names here, when they differ from yours, are more relevant. The railroads, as you call them, are railways here, and certainly they are not 'roads' anywhere. A road is a different thing. Then, 'car' is not used, that is a contraction of carriage, and slangy, as all contractions are. 'Freight' they call 'goods.' You can freight a ship or a train with goods, but the goods are not called freight. A 'depot' is a place of storing or deposit, and has nothing to do with a 'station' where passenger traffic is carried on. The name is not used here at all in connection with railways. Never say 'track' for the permanent way. It is convenient and short, but belongs elsewhere. It don't mean two iron rails laid on sleepers, but a mark or print of some-

thing that has passed. 'Baggage' is luggage, why I don't know or don't care, one is as good as another and both absurd. 'Booking' is buying a ticket. We don't use the term in America, but have one in its place, 'buy a ticket' is its equivalent, but we do nothing of the kind, we buy transportation.

"That will do for railway matters, except one general hint, which is, don't imagine what you have heretofore seen at home is correct, and all that differs from that is wrong in proportion. With that idea you are no traveler, and your time and passage money will be wasted. Just now you are an Englishman by courtesy, endowed with all their rights and privileges, and you should certainly concede them the privilege of knowing their own language, the one we call by that name."

—————From a fine hotel in Sackville Street we went down, late at night, to go over to England in the mail steamer, a rakish looking boat with paddle wheels. I descended some water stairs at the end of the dock and got a look at her bow. It looked like the point of a dagger. When the mail came in from Queenstown, we left. Such a celerity of handling, getting ready, and getting away I never before saw or imagined. In a minute's time from "let go" we were moving rapidly out of the dock, and I noticed everyone making for below. My uncle passed me on his way down, and said with a peculiar smile, "Tech, keep hold of something, she may dive."

I was holding to a chimney stay. An old "salt" in water proofs said "better go below, sir." I had no notion of the kind. For years I had been reading of these very boats that get fined about five dollars a minute for not coming in on time. Here was a chance to

see the fun; go below, not I. The first thing noticed was that the steamer did not "pitch," although going across the seas. She kept right on a level course, shot through wave after wave, each one flying higher and higher, but there was no thought of them ever reaching the high deck where I was.

That was a mistake. There was a tremendous shock as if we had struck a rock, and the next thing I was pinned down on the deck like a postage stamp. It seemed to me there was a ton of water on my back. I was full of salt water inside and out, choked and saturated, and there was old "Tarpaulin" laughing at me, and repeating his cynical injunction, "better go below, sir." I went below then, and was taken in charge by a cabin steward who my uncle, as I afterwards found out, had bargained with to dry me out.

It is not quite clear where the best point of view is for one of these channel mail steamers, but that it is on shore somewhere there is no doubt. They are amphibious, pay no attention to seas, go over them, through or under them just as the course determines, leaving a white streak behind.

CHAPTER IV.

GANGAWA' TILL NEW YORK—THE EFFECT OF TWO TURNS A MINUTE—BRITISH LOCOMOTIVES—NEW LONDON.

—————Speaking of steamers, I am reminded of a story told by Engineer Jones, the man of "beam engines" who was previously mentioned in these notes. Mr. Jones was not always a "beam engineer," he has seen salt service in various seas, antipodal and other-

wise, and carries the usual mess room quantity of anecdotes.

One of these relates to an old Scotch engineer of the Collins and Cunard times 40 years or so ago. The engineer, whom we will call McNab, was in the New York and Liverpool service, and had engaged an assistant in Liverpool who on the first night out, at the change of watch went to the "Chief's" cabin to ask if there were any special orders for the night watch. McNab thought a moment and then said, "Mr. Blackie, ye'l niver mind the mates the night, they are like cats and dinna like to get their feet wet. Go you out to the fore-deck yersell, and if there is not too much water comin over there, slap the coals in till her and let her gang awa' till New York."

I think the story is true, it sounds so.

—————Again respecting "water comin' over" I will relate some experience of my own sea travel. We were in a 5,000 ton vessel driving to windward and everything was wet up to the foreyard. The skipper in talking of the matter to some of the passengers said that two turns less per minute of the screw would stop the water from coming over.

This seemed incredible, and, after some bantering, the captain, after asking us to count the revolutions, took out a card, scribbled a note and sent it below to the engineer on watch. The screw ran down from 68 to 66, and in half an hour the forecastle was dry. The water was stopped instantly. Of course at this day there is too much free board to ship spray, except in "tremendous driving" to windward, but in the older ships it was a great discomfort because the spray turned to a kind of mist and came beyond the waist, or even to the after deck.

—————To get on land again. I have had my first good look at a typical English locomotive and I like it. I expected to be disappointed, and would have been, only that one of our professors had in his lectures so thoroughly imbued us with a hatred of machine ornament, that the English engine seemed natural and right. Nevertheless there seemed to be a section missing where the pilot, or in Western parlance, the "cow-catcher" should be attached.

There also seemed to be a great want of many other details as though the engine had been partially stripped in the round house and sent out without being "dressed," but looking under it I found all that were required details and nothing more. The solid end side rods that fought their way to our country after some years of use here, looked natural, but the driving wheels reminded me of a bicycle. The long slender spokes, sixteen in number, and the light weight of all was a miracle. There was seemingly not half the metal in this six foot wheel that we use in ours, five feet in diameter. The rule of this company is to paint or caseharden surfaces, no polish anywhere, not even on brass parts where there is no finishing required.

I am watching these railway matters pretty closely and am trying to see things impartially, but one thing must be conceded now, and that is, that criticism of English locomotive practice is rather a dangerous kind of amusement for any one with a mechanical reputation at stake. I have read volumes in the form of letters and essays on English and American locomotives, and am going to look the matter up for myself.

One more thing is certain, that is the speed at which the trains are drawn. We left Liverpool at 3 P. M.,

and at 7.25 were landed at St. Pancreas, London, more than 200 miles away. In respect to speed, the run was not exceptional, but in the regular service and time.

Unprofessionally, perhaps, I must put in some notes here of "impressions in London," of which first and mainly is the evidence of wealth. Essays on the *per capita* wealth of this or that nation are well enough, but here you "see" the wealth. There are millions wherever you look. Why the St. Pancreas Station has cost enough to build and equip a considerable railway.

The dry observations of a strange traveler have but little interest and less value. Their chief merit is confined to "impressions." I propose to have my Uncle furnish mainly whatever is to be set down for fact in these notes, and I will write out impressions. He is a Scotchman by trade, and is at home in Great Britain as well as many European and other countries where his vocation has called him.

On the way to the hotel I remarked to him that there were no old buildings such as I expected to see. "Old," said he, "who told you London was old? It is old in years, but in no other sense. Why it is one of the newest cities in the world; cities, I say, not a condensed aggregation of people. Population don't make a city. Peking and Yeddo are not cities. It takes streets, public buildings, sewerage, municipal government, parks, hospitals, railways and a dozen more things to make a city. Nearly all the great buildings here are new. Twenty years has made a new London.

"Then again London is not a city, but is a collection of cities, only one of which bears the name. The core, to so call it—one mile square—is the 'City,' and ninety-

nine other square miles of area are separate towns or cities. The whole is governed by the Metropolitan Board, except the City—the square mile. That is a separate part which was once within the walls. All the rest were once villages around. We are now in Bloomsbury, one of these villages, that has a third of a million of people in it.

“The streets you say are crooked, well wait a while and you may understand that even. There is scarcely a spot in London where if conveyed blindfolded, one cannot at a glance tell where they are. A city laid out like a checker board looks well on paper, mechanical in fact, and Satan himself would never learn to find his way about in it. In a month’s time you go over this whole place of five millions population and find your way. Any one can, unless born here, which you may call a paradox for the present.” I can’t explain it, but that is no matter. A native never knows his own city so well as a stranger will learn it in a month.

CHAPTER V.

PENN AND MAUDSLAY—LONDON PENNY BOATS—SHIPBUILDING ON THE THAMES—DRY LOAM.

————— I don’t know what of London to set down first in these notes. The city is a world by itself, not only commercially and politically but “technically,” and in an industrial sense. London machine works are accounted the best in the United Kingdom, and command the highest price for their products. The great establishments of Penn and Maudslay, famous all over the world, are here. My uncle and I went down to

the Penn works, at Woolwich, to-day by the penny boat line, as it is called. The engines of the boat were made by the Penns, and were to me a curiosity, because of their arrangement. They were of the oscillating type, and astonishing because of the extreme lightness of the various parts.

It is a common thing at home to hear of British clumsy work, and how everything in England is made heavy and unwieldy. One of the boys at college asked Professor Eisenschlager about this one time, and his answer was "Did you ever see a Coventry bicycle, that, of all machines ever made, has the least material and the narrowest factor of safety?" The factor of safety clause I conceded at once, having been pitched head-long into a stone pile that same day from one of these Coventry machines, but as a matter of fact there was a time, and a tolerably long time, in which a Coventry bicycle was the lightest machine in the world for its strength and purposes.

The engines in the penny boats are much the same, even the crank shafts are worked down to correspond with the strains, tapered and swelled between the bearings. The connecting rods hitch overhead, the cylinders being directly beneath the shaft, and the cranks sweeping around so as to almost touch the pistol rod stuffing boxes. The air pump is worked from a crank in the center of the main shaft. The eccentrics are loose on the shaft and for reversing are thrown from one angle of advance to the other, coming up against stops each way. The valve movement I could not make out, it is a resultant of the eccentric's motion and also of the cylinder's oscillation, but one thing is sure, if the weight of the engines is divided by their horse power the quo-

tient will be less than in any like machine I have ever seen before.

The boats are about 100 feet long with 12 feet beam, made of thin steel, with feathering paddle wheels, and run 12 to 14 miles an hour. They are started, stopped and handled about, much as one would a canoe. It is wonderful, this river traffic, and if not managed well the whole fleet would be jammed and sunk in a week. It reminds one of the street driving here, and that reminds one of eternity, that is, a person expects every moment to be smashed, but never is.

We arrived at Woolwich, a suburb of London on the Surrey side of the river, nine miles away, and saw the outline of the great arsenal. A short walk back from the river brought us to Penn's works, John Penn & Son, where, as a rule, only government work is done now. I mean in marine engines, because the Scotch have carried off the hulls and merchant work, and the Thames knows it no more.

My uncle explained this as we came down the river on the boat. "You see," said he, "these London workmen consider themselves worth more per day than those on the Clyde, and they are, when their skill can be brought to bear, but that will not do on a ship's hull where the measure of a man's performance is muscular rather than intellectual, but it will do in respect to making steam engines, as is proved by past and present circumstances. The engine work has remained here, and the best engines are made in London.

"It is not twenty years ago when there were famous shipyards along the Thames here. Samuda and Dudgeon on the Isle of Dogs. The great yard at Blackwall, the Thames Company, Scott Russell's yard at Deptford.

Penn's also, where we are now going, was a great shipyard. It is all gone now, or nearly gone. Coal dues, local rates, taxes you call them, and other elements of cost, among them wages, became dearer here, and the industry had to move to the north where it is now, and where it will remain when your grandchildren read these notes you are making up.

"I am not a prophet, a philosopher, or an economist, but have watched shipbuilding and other skilled industries enough to know they settle where production is cheapest, and all the silly efforts of law makers and theorists to found industry on any other than the circumstances of "cost" are not worth attention. That element of cost hardest to determine and last to understand is wages, and to rate this by the amount paid to men for their time is folly. The rate of wages is less on the Clyde than here, but that is no matter, the production of the wages is most likely in the same proportion. I think there is no great difference in this respect between the Thames and the Clyde, and there need not be. Other things I have named make up enough to move the industry, and it has gone—gone to stay."

—————The first thing at Penn's that attracted my attention were the iron castings. I had seen a good many before but none like these. They reminded one of wooden "patterns" finished with steel colored paint. The surfaces were as flat, the corners as true, and the outline as perfect as woodwork could be made. I called my uncle's attention to this, remarking that the patterns must be good. "Patterns!" said he, "are not used, at least for anything you are looking at. They don't need patterns here, and don't cast in green sand anything except grate bars and the like." This I

found to be true when I came to the foundry. The moulds were either loam work or dried by firing. Loam and "dry work" are done to some extent in all large foundries, but not to the extent it is carried out here, and I am just arriving at an understanding of its objects.

A cast iron part or structure without inherent strains can be relied upon, but one cast of hot iron in green sand and ready to break because of cooling strains must be double the size to have any safety. This is the difficulty with steel castings, run from metal 500 degrees hotter than iron requires; it is a treacherous material unless annealed. Steel framing cost the owners of the "City of Paris" a pretty sum, it is true, yet it is hard to see why merchant marine engine frames are not built up with wrought iron or steel struts and braces as they are in many war steamers.

CHAPTER VI.

A STEAM HAMMER FOR GRAVITY—A STEAMBOAT ON A HILL.
EXPLOSIVES ON THE PACIFIC COAST—THE LINE OF
LEAST RESISTANCE.

————— Looking over the incidental part of these notes I find one or two old ones that will do to sandwich in here. The first relates to a Scotch engineer whom I met on the Pacific Coast, in San Francisco. A veritable type of that nation, of which Mr. Thiers, the French historian, said "there are only four millions of them, which is a God's blessing, for if there had been a few more they would have ruled the world."

I found out there, in California, a Scotchman who had, at an early day, taken out to that distant land one of "Jamie Nasmyth's steam hammers" to crush quartz with. It was got up with difficulty into the mountains, erected, and enclosed by a shed of one-inch boards. When ready, a large piece of quartz was put on the anvil, the "tup" raised, and a full head of steam turned on top. The result was surprising. The one-inch boards were riddled and the whole place scarred with flying quartz. Every one within range was more or less hurt by splinters or quartz, and the Scotchman, who now resides in San Francisco, came near being hung by the miners.

Here is another story in my notes, that relates to an eccentric but able, mechanical engineer from Ayreshire, a relative of Bobby Burns, the poet. This man, in 1854, to secure cheap land went out on a hill in San Francisco, and started a machine shop there. It was driven by a windmill, and if any of the readers of these notes know that locality I need not say there was no lack of power.

To prevent his anvils and other detached implements from being blown away he arranged his shop in a cellar, and did a good business. He, in common with all Scotchmen, had a weakness for steam craft, and set out, when opportunity served, to build a steamboat up there, 300 feet above the bay, and built it accordingly.

The boat was 40 feet long, 7 feet beam, and a propeller in type. When done, came the problem of launching the boat. A mile horizontally and 300 feet vertically was beyond any gradient Mr. Lochhead had previously dealt with, and he began treating with teamsters to haul the vessel to the water. Just here

came an illustration of California methods, not quite abandoned out there at this day.

One man thought \$250 about the figure for hauling the boat to the water. Another said this was too much, he could do it for \$200. A third said the thing was a swindle and \$100 was enough. Lochhead was disgusted, and waiving contracts asked a friend of his to come up and haul the boat down at whatever the job was worth.

The friend borrowed two long beams to go on his wagon, took out the coupling pole, and set the wheels 24 feet apart. Lochhead had the vessel raised high enough to load, and in five hours she was in the bay. He then asked the teamster how much his charge would be, and the answer was *five dollars* not including "drinks," which he, the teamster, would pay out of that sum.

—————This will be construed as a joke or perhaps a tough story, and might be either, but it is also true, and contains a moral larger than Lochhead's boat; that is, we learn by experience, and know very little not acquired in that way. The man who wanted \$250 to haul the boat thought, perhaps, it was worth that much, it would be no stretch of fancy to think so. But viewed in any way it is an example of what is called stupidity, and a parallel for another yarn of like ilk I heard out there, that involved another Scotchman.

It relates to an old stamp mill in the mountains, that was being taken down to make way for a modern one. The stamp heads were huge masses of iron, with double stems in each, the cams working between the stems on cross tappets which embraced both. The stamp heads, stems and tappets were one mass of rust, and too heavy to handle without taking apart. Several men undertook this job by roasting the heads on fires, hammering

with sledges, breaking drifts, and venting profanity.

The stamp heads had keyways through them, alongside the stems, and as the keys were out a young Scotchman then conceived an idea which he at once put into practice. While the men were at dinner he cut up some dynamite cartridges, and putting a quarter of one into each of the keyways fired them with a fuse. He "popped out" all of the old stems before the men returned from dinner, which amazed them and spoiled a week of work.

————— I found along here a number of "notes" from the same region, a good share of them connected with dynamite. Powder is not considered dangerous on the Pacific Coast. The people blow out holes to plant fruit trees, dig post holes for fences, and split their fire wood with dynamite cartridges.

A well known engineer had a wharf to build, and some hundreds of old piles to pull out or saw off. After spending several days in sawing off a few of them, he lowered a dynamite cartridge to the top of the mud, about 15 feet below the surface of the water, fired it, and shaved off a pile as clean as a mower cuts a weed. This was fun for the boys. The engineer was called away for half a day, and when he returned the men had not only cut off all the old piles with dynamite, but were amusing themselves mowing down a new wharf.

————— While on the subject of dynamite as a subaqueous agent, I will revert to some experiments made during the Civil War. Most people will remember how it was attempted to throw a wave over some sand forts at Charleston, and how General Butler undertook to blow up Fort Fisher with gunpowder placed "against" the walls. Neither attempt amounted to

more than a waste of powder, and the development of ridicule. The War Department came to the conclusion a little science in the matter would be a proper ingredient in these gunpowder schemes, and detailed Gen. B. C. Tilghman, of Philadelphia, an able scientific man, to furnish some whys and wherefores in the case.

The General's report was positive, curt and explicit, something like this, "The force of explosion follows the line of least resistance." This was ten words and enough, but had to be based on experiment; so the General put a bag of powder under an immense wooden beam of hard pine, bolted up solidly, sunk the whole twenty feet or so in the Schuylkill River, fired the charge, and found the powder had bored a sufficient hole up through the wood and left by the shortest route.

The General's unprofessional explanation was laconic. "Where else should it go?" said he, "it certainly was not going 8000 miles through to the antipodes, and it was not going five or ten miles laterally through water and earth, so it came upward twenty feet, on the shortest line and the one of least resistance."

Dynamite, if one is to believe half the stories concerning it, don't act that way, but this divergence has now covered five pages of my note book, and I must get back to London again.

CHAPTER VII.

ISLE OF MAN—MANX CATS—PICKLED AT SEA—KIPPERS—
LAXA WATER WHEEL—PEARS' SOAP.

—————We are going over to the Isle of Man in a day or two. This principality, the land of cats without tails, the Manxmen's land, with a government of its own, is midway of the Irish Channel, four or five hours' run from Liverpool, independent of weather.

—————Here is the itinerary, as the tourists call it: Went down by morning mail; four-and-a-half hours from London, 200 miles; and out to one of those paddle steamers, like the one I described some time ago—the Dublin one. May my shadow grow less if ever I go into another. It was blowing half a gale, which means a gale and a half, anywhere outside the English or Irish Channels, and in one hour from starting there was salt water going down the smoke stack. It was an excursion boat, and a fine one, or intended to be. We had about a thousand passengers—half of them were seasick—piled up on the cabin floor, some places two deep. The air, or gases, coming up out of the hatches, could be seen and felt, so I stowed myself on the deck to the "leeward of the chimney," as the mate called it, and hung on by a stay rope.

This gave the advantage of warm water, or hot water rather, because all that reached me had first been on the smoke pipe and came down at from 100 to 150 degrees. It was refreshing, but lasted too long, besides I was not accustomed to bathing with my clothes on. It was the intention to describe the behavior of the steamer, but not much of this was seen. It was felt, however, and

until the contrary is known, I will contend that the bulwarks and freeboard of that boat were of India rubber. Iron, steel or wood could not have withstood the blows, twisting and hammering. We finally shot into the little harbor behind the breakwater at Douglas, a fine little city devoted to "kippers" or smoked herring. This I say because the main business there seems to be to catch and prepare these fish, also catching and preparing tourists.

At Douglas my uncle emerged as dry as an Egyptian of Sorasis' time, with a perfume of tobacco and toddy about him—said he had been "chatting" with the chief, and as I discovered had been playing a joke on me. "Tech," said he, when we started, "the scenery in the channel is fine during brisk wind, but you seem to have been in the hot well. Enjoyed yourself, eh?"

We drove to a fine hotel, the Castle something, that had a weird history, not worth recounting. My uncle had a huge fire built in a wide grate and I began drying out my "environment," promoting evaporation with hot water and spirits inside. It was a place of comfort certainly, that grand old inn.

My first observation was the people. Take the waiters in the hotel, men and women, and they would pass for the "top of society" in most parts of the world. I do not mean in manners, although that may perhaps be included, but in feature and general appearance. The Manx people are the finest looking race in Europe and are a "race," because they have been here for a thousand years with scarcely any admixture from the mainland. They resemble the Irish more than Scotch, because mostly of dark complexion and, as before said, are wonderfully fine looking.

The next morning, a beautiful one, we took a cab to the Laxa lead mines to see the great water wheel and the country. It is a distance of seven miles or so over roads that are perfect; winding around cliffs that descend sheer into the sea, which was then as smooth as a lake. One of the first, or rather several of the first things seen, were the veritable "Manx cats," and sure enough, without tails. Only a short stub! There is no myth in the matter; it is a straight story.

We passed the Governor's house, and learned from the coachman a good deal of Manx affairs such as he could know, and that was no small amount. His information, and a great deal besides from other sources, led to a belief that the Manx administration should be cut up in pieces, diffused as a leaven, in the affairs of more pretentious countries. One might well endure cats without the caudal appendage and eat "kippers" every morning, to gain the advantage of living under such a government as this seems to be. There are opinions as to policy and the effect of public measures, but venality, or want of honesty and capacity, none.

The Laxa water wheel is to operate the pumps in one of the mines, or the system of mines here. It is more than sixty feet in diameter, and although not near so great in power as the Burdon wheel, at Troy, N. Y., is much more of a curiosity.

The water is brought underground, in pipes, and rises in a circular tower of masonry to the top of the wheel, and then flows out in a spout at right angles to the tower. This tower can be ascended by a neat winding stair around the outside, and the "spout," which is covered and has a railing around it, furnishes a walk out over the wheel.

On one end of the main shaft is a crank of ten feet radius to give a stroke of twenty feet. A long connection of wood, iron trussed, reaches to the first of a series of links, also of wood, each about fifty feet long, that run on a railway at the ends. These links extend at least a quarter of a mile, and do not in that distance consume two per cent. in friction. From the ends of these the pump rods, bobs, etc., are the same as are employed in other places.

The wheel and its connections, including the water tower, seem to be set up in the air, even the tail race is an enclosed flume that conducts the spent water back to the tower where it passes underground again.

—————Just here is a chance of some mechanical moralizing. Suppose that wheel, instead of being constructed with arms and tie rods as light as a bicycle, had been a heavy, cumbrous affair of the utilitarian kind, and had been set down in a pit in the usual manner with an old box penstock and chute; half its cost would have been saved, and what of that? No one would ever have gone out to see the wheel. The cab fares extracted from affluent travelers will each year fully pay the difference, and as a large share of the community consider money thus earned a gain of wealth, it is much more legitimate and consistent than selling "Pears' soap," and much else that is invented to play on human credulity, and extract shekels from the unwary.

CHAPTER VIII.

THE SCIENCE OF WAGONS—JAMS IN BROADWAY—LONDON
DRIVERS—BUILDING CITIES.

—————I wonder if horse and wagon traffic will be technical enough to go into these notes? Wheel traffic is a tolerably extensive matter in human affairs; like some other great industries, has no literature, and it is time some attention was given to it.

In a great city like this of London, and indeed, in all cities, the most prominent element is houses, next people, then horses and wagons.

The houses have absorbed the highest human talent, engineering and architectural; people have engrossed the greatest philosophical minds the world has produced, but the horses and wagons, third in rank, find no place in science, philosophy or ethics.

The subject was thrust upon me here. Just think of the swarm of vehicles, goods and human beings crowded into this population of four and a half millions; think also that they are a shopkeeping, commercial people, and then again think of their traffic being carried on in narrow streets, few in number and irregular in course.

To explain this in some measure is my present task, and, as usual, my Uncle Camshaft had to be called in. I always consult him before setting down in these notes anything relating to a new subject, and I quote him as nearly as possible, except now and then an expletive of a non-technical nature. On street traffic he said: "Did you ever see a jam in Broadway, New York? If you did, then you have seen the most stupid thing imaginable, and one you cannot understand fully until you study the

subject here in London. Jam in Broadway! Look at the Strand or Cheapside; look anywhere here, on the bridges even, and count the vehicles, or ask some one who has, it is all tabulated—13,000 cross London Bridge daily—and then compare with Broadway. There they meander without system and without control. Here they drive by a system that has rules as rigid as those on a man-'o-war. In the first place, you must remember that street traffic follows the same laws as liquids flowing in pipes. The width of a street represents the bore of the pipe, and the speed of the street traffic is the same as the flow per minute in the pipes. If you will observe in the streets you will see all the traffic moving about twice as fast as in New York, perhaps more than twice as fast. You will see four lines of vehicles; two each way; the inner lines at six to eight miles an hour; the outer or curbstone traffic, in two other lines at three to four miles an hour. You may see cabs and carts leave the inner or fast lines and wedge into the curb lines. That means they are going to stop somewhere near.

“Put one of these Broadway jams into motion on this principle and the street would be cleared in five minutes. Jams occur here sometimes, but they amount to a ‘slowing’ of the traffic. No such thing is known as a chaotic mass of vehicles all trying to go somewhere—wherever they can get clearance for. There is no division of the traffic, ‘crawlers’ mix in with passenger service, and above all, heavy loads of merchandise right among the express traffic it may be called.

“Just note down in that book of yours that driving is a science in London, also that it is a trade that must be learned, and you might also note down that this remark applies to no other city. Also keep in mind that people

can cross a street in comparative safety here in the densest traffic. They cross, two lines going one way, then they come to a guard or refuge in the middle of the street, where they can stand in safety until an opening appears on the other side. Just imagine a person, a woman for example, finding her way to the middle of Broadway. What would she do next? Could not get back and could not go forward, and could not remain. The only chance is to fly. I have been there, and been trapped that way. It is not to be laughed at.

“There are thousands on thousands of foreigners here, from all nations, and in all classes of business, except driving. Just make a note of that too, and the first one you find driving, who is not an Englishman, call on me for a game dinner at Simpson’s, or a ‘spread’ at the Criterion.”

I found since noting the above, that my uncle was correct, but that even making all his allowances, the traffic in London could never go through the streets if it were not relieved by the overhead and underground systems. Twenty-five millions or so of underground trips and fifty millions of overhead railway trips in one year relieves the street surfaces.

—————Getting railways into, out of, and all over London, is one of the greatest engineering feats here. There are railway stations everywhere. One cannot get five hundred yards away from one in the dense portions, and when he reaches one he can go from there “anywhere.” He can “book” to St. Petersburg, Alexandria or Bombay. It is a wonderful system, far beyond any power of mine to describe or even to understand. But there is one thing I am beginning to understand very well, and that is that authorities here are on the

look out for ability to design and direct these urban problems. The man who succeeds comes to the front; men like Sir Joseph Bazalgette, Sir John Fowler and others. Great engineers require no "pull" except talent, and are paid for that.

I am also beginning to understand another thing, and that is that building cities is the most intricate and extensive of all problems. It is several years since I heard my uncle venting his wrath on city builders. "You have," said he, "little engineers and architects discussing and contending about curbstones, sewers, and the effect of orders of architecture, but where is your science of cities? The whole plan an economy of one. Cities are built by accident, and the great fact in their development is the increase of land values, and whose pocket the increment gets into. Cities were, in many respects, better built a thousand years ago than now, because not developed by commercial gain, but by governments. What does a merchant here or in New York care about the development of his street except his own house? Improvements bring rivals, and so long as his house is the best, he has no aim beyond.

"The commercial and trading element never improved any city, and never will; that calls for something else. A purely mercantile city is always a purely disgraceful one. Commerce deals with gain, not public adornment and conveniences. Its principles are selfish, and in the nature of things, must be."

CHAPTER IX.

DOCKS AT MILLWALL—GOTHS AND VANDALS—A SCARCITY
OF SOIL—A HOTEL COMMANDER—THE CURIOUS KALKE-
LUNG—A FIRE TO LAST TWENTY-FOUR HOURS—
THE RED ANNEX.

—————“Go down,” said my uncle, “to the Millwall docks and see which of these Swedish steamers is best, and take passage to Gothenburg.” This was to me delightful news. Not that I was tired of London, or had seen more than the crust of it, but because I felt that enough time had been wasted over a hopeless undertaking. The “horizon widens as it approaches,” so does this Babylon, and there is no way to know anything of it worth recounting, without living here for years.

I had become expert enough in finding my way. That is easy in London, no matter where you want to go. Millwall docks are on the Isle of Dogs, at the east end, and where the Swedish steamers lie. There are 236 acres of these docks. Like all others they are locked; that is, the gates are opened at high water only. The tides here reach 19 feet sometimes, and there is no such thing as lying at a pier with that variation.

I went down by boat and found two steamers nearly ready to sail, and selected the best looking one, “booked” and went back to report.

It costs two guineas for about 600 miles by this direct route, and three guineas via Hull, which is the mail, or main route by water. Of course, quick mail goes by land across the channel, through Belgium and Germany, but not much quicker.

Next morning we went down to the docks by train to embark, and I soon found out that one does not learn all about sea travel in crossing the Atlantic. There were a good many queer things here. The saloon, or cabin steward was a "Mamselle," who had charge of all, and good charge it was. Everything was Swedish. Language, food, customs, and I will add, courtesy, which latter is a very plentiful commodity with these "Svensk" people. They have no such term as "Swedish," or Sweden. It is "Sverige" for the country, and "Svensk" for the people.

My uncle, who has seen much service in the German ocean, was in fine humor, and set out with a lecture on the country while we were waiting for the dock to open.

"Now, Tech," said he, "you will enjoy for a time the relief of not watching your purse. It will be a curious sensation. There is no bargaining to do, and no cheating, so long as you keep under that blue and yellow flag; neither will you be drowned. These skippers are the best in the world, and have to be. I just now said the water would be like a mill pond. So it will up to November, then the North Sea will be a boiling cauldron for four months. I have been nine days making this journey to Gothenburg, standing into the gale, going astern and then running under the land to 'lie to.' Nothing is put on these decks after November. It is the worst sea in the world in winter, unless it be the Baltic, and no one goes there in the winter.

"This vessel is built of Swedish iron. Run her on a rock or iceberg and she will back out with three stems—one in the middle and one at each side where the plates have doubled in. Run her on the sand and she will lie there all winter. The spars and decks may be ham-

mered out of her, but next spring they will shovel the sand out and pull her off with her frames, skin and main parts all in shape. Fact! Have known it so."

We had a fine passage of 60 hours or so, and entered the mouth of the Gotha River early in the morning. I was "dumbfounded" at the appearance of the shores and went down to rout out my uncle. "See any stone or rock about," said he, "if so do not mind that, but look out for soil, and as soon as you see a hatful come and tell me."

The mist was clearing away. On the port side lay the Fortress of Winga. Little islands all about, mainland on the starboard, but of earth not a spoonful. All granite—cold, gray granite. Down in the sea I could discern crags beneath us, how deep I do not know. The water was as clear as light. But the granite!

We entered a river—a fine, wide stream with a strong current, which I mistook for ebb tide, and in five miles more were alongside the granite piers of Gothenburg, pronounced here "Yetaborg."

—————In the land of the "Goths and Vandals," the mother of nations, as the French say. Rome was conquered from here; so was most everywhere else, including England at sundry times, and finally by William, Duke of Normandy, another of this same lot. This seafaring, buccaneering, fighting people that had nothing to do and little to eat at home, led the world a merry dance for six centuries or more. They are the colonizing element, and have some part in many modern nations; they are the discoverers of the "majority," inventors of republican government, and of "*bränvin*." I am, however, becoming non-technical.

The craft about here are mainly steamers, and the commodities of trade seem to be mainly wood and iron. Thousands of tons of each of these, and one vessel for Japan, loading with matches! Yes, loading with matches, after stowing some tons of "Swedish-bar" at the bottom for ballast.

This is the land of matches, *utan svafvel eller sulfur* (without phosphorous or sulphur). Matches made of birch, that do not poison or choke one; nice, light matches "made to gauge;" boxes also, uniform throughout. There are 1,500 people in one match factory at Jönköping, and a dozen more factories elsewhere. I well knew the matches before, and had seen them at home by thousands. The British could not imitate them, found their trade injured, and pursued their usual pacific and shrewd plan of "buying out the works." Bryant & May do not make now many matches in East London. They make them in Sweden, at Wenersborg, and elsewhere in the middle section.

A good deal of this I heard from my uncle, who as usual knew all about everything we came across. "The British idea of a match," said he, "whatever that means as a name, is a good stout stick as long as your finger, with a knob of brimstone on the end that suffocates the users and kills the makers. The Swedes are chemists; also mechanics, and found that chlorate of potash was a better fulminate for that purpose. They make matches for the world and will continue to do so, just as they do some other things of the kind, if they do not choke their manufactures by some mistaken commercial polity. Why there is an armory here, inland 300 miles, making Springfield muskets the same as are made in Springfield, and with the same tools. I happen to know they have,

just now, a large order from the Turkish government. They have a cannon factory, or an ordnance works, 400 years old, at Finspong. I have seen it; and at Sandvik there was a Bessemer plant for steel about as soon as Sir Henry got his process perfected. Just sharpen that pencil of yours at both ends. I propose to fill up that book for some pages to come.

“These large wooden buildings down along the river there, and one or two on the other side, are wood-work factories, where is made joiner work for London, Paris, Berlin—in short, for everywhere; also finished houses to be taken down, packed and set up again where wanted. You are thinking now of what is called at home a planing mill. Yes, in one sense, but with a difference. Go down there and you will find an architect’s room. You will find a staff of complete draughtsmen. All the machines will be of the best—all the work too. There will be drawings there from Paris for house work, drawings from Hamburg, Vienna, Berlin, Stockholm—in fact, everywhere, and just outside, in that “red annex,” on this side, you will find something with a wonderful meaning, not to be found in the world beside. You will want two pages for that.”

My uncle was serious. That “red annex” may require a page or two, but some other things first. We went to the hotel and had a suite of rooms assigned to us—two large and one small one. The ceilings were about 16 feet high, otherwise everything French, or Franco-German in style. The hotel economy seemed to be on the co-operative plan. No one seemed to own or manage it, and the business of the house seemed to be done by the porter, who represented alike the guests and the hotel. He was interpreter, business agent, banker, and more—

a general factotum. Whether he ever slept, or if there were "two of him," I could not make out. We had a fire made, and here goes another page on that matter:

————— I was absorbed in the fire making, but my uncle gave it no attention except to say, "Tech, keep a weather eye on the 'kakelung,'" pointing to what I thought was a cupboard. It was about thirty inches wide by two feet the other way, ten to twelve feet high, covered with fine porcelain plates, polished brass doors at the bottom, also at the sides.

The girl who brought the wood opened the lower doors, disclosing a set of inner doors and a flue in the center about twelve inches square. In this she set the wood up on end until the flue was full, and then fired the lot, shut the brass doors and sat down to wait.

In a few minutes the fire was roaring, and in fifteen minutes was burned out. The girl then closed all doors tight, and also a damper at the top, cutting off all draught. That act over, I looked up to my uncle for explanation.

"You are wondering," said he, "where the effect is coming in. Just wait awhile, and while waiting imagine that bunch of wood burned in an American stove, or in an English grate. That wood contained a certain quantity of heat units. In our country they would all be out of the top of the chimney now. In this case they are all in the room yet, as you will see presently, and will remain here, as you will find further on. What you are observing is concrete common sense, as you will conclude some day.

"The flue in that stove is 60 feet long. The heat from that fuel when it escaped was not more than 150 degrees, perhaps not that. You can hold your hand in the flue

and there is a little door up there by the damper to see how hot the gases are by a thermometer. All the heat in that wood is in that stove. It will come out directly, and there will be a fair part of it left here tomorrow."

On examination I found the porcelain plates warm at certain parts and warming elsewhere, and in one hour the whole room had a genial temperature. My uncle showed me how to stow my damp shoes in the side doors of the kakelung (lime-oven), and I am a convert. Let it be written down in the great record of human conceits, that the colder a country is, the less fuel is burned, and that in all these patent contrivances for heating and choking people, in which we excel, there is not one to compare with the common-sense Swedish kake-lung. Heat here is a commodity, costs money, and is turned on like gas and water. The gauge of loss is ventilation. That too, is a commodity here in winter, I am told by my uncle; but our stay will not reach the cold period—at least, I hope not. Salt water frozen eleven feet deep may be a curious thing to see, but I can manage by reading about it.

My uncle says he will give me a start around in the town, and then go out to an island place to seek some old friend of his, while I "do the town," as he calls it. It is not a big town, but it is the finest one I have ever seen in many ways. It is principally of granite, built on piles driven into a substratum of mud; canals of fresh water in the principal streets, and no mean houses at all.

I am curious to know respecting that "red annex," with so much significance. There is something there of importance. My uncle does not joke about such things, but I have not the least idea of what he meant.

—————The Red Annex, mentioned in my last notes, has been investigated, and instead of containing, as I supposed, some peculiar machinery, there was only a squad of boys, ranging from five to fifteen years of age. They were orphans, and I was not long in finding out what my uncle was hinting at. These boys are joint “wards” of the government and of the works with which their building is connected, and the scheme of their care and education is one worthy of the sagacity these northern nations have given evidence of in their social economy.

The boys are taken by the government and domiciled in the Red Annex, under a contract with the firm or company owning the factory. The factory furnishes buildings, heating and food. The government furnishes instruction, in the way of schooling, maintains discipline, and conducts the moral part. The works furnish implements and material for working, and the two go on together.

The boys make toys, baskets, rugs out of pine shavings, and a hundred more small things of wood or iron that do not require much skill. There are forges, work benches and the usual paraphernalia of a shop, but mostly of a miniature kind. The food is plain, very plain, but wholesome and enough. The work is also plenty, and there is no idle time in this embryo shop. Discipline is kind, but like the laws of the Medes and Persians is inflexible.

The main point of all, however, is a romantic one. The energy and success of all human efforts depend upon some end in view, some goal to be attained, and there is here such an object. Between the school and the works is a mysterious door through which the orphans

after certain qualifications, pass on into the works and become full apprentices. To gain an entrance at this door is the dream of all. For that object no labor is too hard, no effort too great. The mysterious door is there in view, a perpetual talisman, and as a moral agent has more power than all the mottoes, maxims, lectures and the like that were ever invented.

It is a fact there present within grasp, and means a great change of life, more privilege and elevation to a new sphere, in short, is, as my uncle claims the most ingenious educational expedient the world has ever invented.

After passing the "Red Annex" and his term in the works, the boy or man goes out into the world an educated mechanic; an independent man, to add to the working force of the Nation. He has not, at any stage, been a charge upon the country that is, felt or worth considering. He has not suffered from being an orphan, indeed the reverse in many cases.

————— I find here a wonderful number of things of a similar nature that could be written about, some of them technical, as will appear, but for the present will lay them aside. The factory was a curious one in many ways. The timber, which was all received as logs, was small, crooked, and such as would be called "culls" at home but out of it was made the most perfect joiner work that I had ever seen. The knots were like the spots on Joseph's coat, and in order to secure panels for doors, clear of knots, they had to be bored out with "bung saws" and cores driven in the holes. In sawing, the logs are not as with us guided by carriages, but are sawed with grain and shape, by gang saws with continuous or roller feed.

The board or plank, no matter how crooked when sawn, becomes straight when piled up and seasoned. The saws are thin, not more than twelve gauge. They run at high speed but as the feed is slow the sawing is smooth and accurate. All sawing of whatever kind, except, perhaps, scroll sawing, is done better than at home, with thinner saws, truer and fast enough. The finishing processes, that is, the joiner processes, I have made copious notes of and will write them out in due time.

—————My uncle came in from Marstrand on a fine little steamer of the Swedish type, late in the evening, that is, late by the clock. The sun is no guide here as to time. He gets in about twenty hours of service above the horizon in this latitude, and a little further up, in Sweden, stays up all night for a few days in June. It seems queer to go out at 11 P. M. and sit down to read a newspaper. Marstrand is a kind of summer bathing place about twenty miles out in the "Skärgord" (rock garden), as the Swedes call it. The whole coast for miles out to sea is sprinkled with rocks, the surface being about two-thirds water and one-third granite, and navigation here becomes an art.

The little steamers are seen everywhere, taking the place of omnibuses with us. They are cheap, complete and ingenious, all of the screw type and built of iron. They are reversed with an eccentric that is mounted on a shell with a spiral key or feather that throws the eccentric forward or back about thirty degrees to the "angle of advance" each way, and the engines have less pieces than any reversing ones I have ever seen.

My uncle was in fine humor when he came in, and busy contending with a Scotchman concerning drinking in Sweden, and laid down the facts about as follows:

"There are no teetotal humbugs here, no horrid examples printed on tracts, moral lectures and the rest, nothing of the kind, but, instead, a law that regulates the matter and forces the rum trade to be respectable. This country, like all other northern ones, has been cursed with drunkenness, especially among the peasantry and the poor. Their liquors are usually only a remove from vitriol in strength, and the climate creates an appetite for alcohol as fuel. They fired up in a fearful way, up to and beyond human endurance. The surplus energy was not expended, as in Ireland, in cracking heads, or as in America by raising sheol. It produced joy first and then stupefaction.

"The Government stepped in and took the liquor traffic in charge. You have heard of the 'Gothenburg Law.' That means that only responsible and respectable people must sell liquor, and must sell it only in a respectable place, and if any one wants to drink they must do it in a respectable way. The least abuse or infraction of the law means a revocal of the license and some other person is appointed.

"There are commissioners of some kind that have the whole matter in charge, and they keep it in charge. No liquor, no rows; no rows, no lawyers and police machinery, why you can hang your coat on the bridge there and you will find it to-morrow morning just where you left it."

The honesty of the people in these Scandinavian countries, especially in the northern or inland regions, is a familiar theme with my uncle. He had, many a time before our coming here, told me of the absence of crime and absence of lawyers, which he seems to think are either a sequence or cause of disturbance.

One of his "lectures," which I noted down and which I expect to hear again, is in substance as follows:

"Lawyers, courts, contention, thievery, murder, crime and the rest, of which there is eternal preaching, teaching and scolding, is not the normal or natural state of people. Look at Gothenburg. You may walk until you are tired to hunt up a lawyer's sign. Never heard of but two there, and they have nothing to do in the way of criminal practice, except to defend foreign sailors. They have a prison there with about twenty convicts. No one gets in there unless they belong there, and no one gets out of there until the end of their sentence, unless to be buried, and most of them get buried. People don't fool with law here. That is a settled matter. It moves like the tides. You cannot go to law here if you want to in any civil case, but the first thing must be arbitration by a governmental or appointed commission of respectable citizens. These act like a court, less the humbuggery of one. There are no technicalities, habeas corpus and the rest, only common sense and finding out the facts. Nearly all disputes end here and there are no fees to pay.

"Such an institution in England or America would save one third of the nation's revenue. They have to save it in Sweden, they have not got it to spend, and don't want to spend it in this way if they had. Sometimes the Criminal Court in Gothenburg is not opened in a whole year, and this in a city of 75,000 people. Talk about civilization. Goths and Vandals! better take lessons from them. They have hammered out Republican Government, self denial and true courage into various people of the earth, and have still on hand a store of good qualities that may be imitated."

I have found out since here that there is a good deal of affinity as well as mixture between the Scotch and Scandinavian people. They live on opposite and not distant sides of the North Sea, and once, or indeed many times, were "mixed up" in war matters. The Faroe, Shetland, and other islands have people mostly Scandinavian in lineage, and the language is, I am told, a Norse patois, so my uncle has, no doubt, inherited some of his opinions of Northern nations.

—————We went around to visit the Slöjd school here in Gothenburg, and the name calls for a digression. The letter "j" in the word is not the grating Latin or French one that sets one's teeth on edge, but is simply "i," long. They call it "i" and put a dot over it. When I say "i," don't understand that letter in our English tongue, which of all other letters is the most awkward to pronounce—a sound that is unnatural if not repulsive. I mean long "i," nonexistent as a sound, I believe, in any other language. This letter is "e" long in all tongues but our own, so "j" is simply "i," or "e" long in Swedish, and what it is for no one can find out.

This explanation I make on behalf of those poor wits who make jokes on such names as "Björnson," which is spelled as rationally as "Smith" or "Jones." Björn is "bear," and Björnson is the son of a bear, or of a man by the name of "Bear," to be more exact. In order to understand this matter, one must keep in mind that Scandinavian etymology and syntax are rational and systematic, and English are neither. I could go on and show how "i" or "j" became metamorphosed into that saw-filing sound we give to the letter, but it is of no use, and what is of more interest to note is that

Scandinavian names always, or nearly always, mean some natural object, such as mountains, rivers, streams, animals, and so on, while in Saxon lineage we have handicraft such as weaver, carpenter, smith, and the like. Scandinavian names are an interesting study, and will be found, in nearly all cases, to contain a "root" as above. Berg, (mountain); strom, (stream); löf, (leaf); örn, (eagle); ek, (oak), are examples.

The alphabet contains twenty-eight letters, counting the modified vowels ä, ö and ø. The latter is long ð. These twenty-eight letters have one sound each, no more, no less, and where an assemblage of them makes up a word, one knows what to call that word, if they can pronounce it, which is by no means certain.

Some years ago it was discovered that the letter "c" was superfluous in the Swedish language, as it is in English, and it was cast out. The academy of something, at Stockholm, requested all writers and printers to omit this letter, and the thing was done. In America, or England, the people would at once have doubled the number, if such a request had been made. This useless letter "c," which has in English the sound of "k" and of "s" but no sound of its own, had smuggled itself into about fifty words of the Swedish language, taking the place of "k" at the beginning of words, in which connection only it was found. It is gone now in Sweden, and let us hope will be gone some day in English as well.

—————Reverting to schools in Sweden, my own notes, while they may be in better diction, do not compare to my uncle's comments when he can be persuaded to talk. It seems this school matter has interested him in some way, at any rate he understands it, as will ap-

pear from the following, jotted down from one of his impromptu "lectures":

"Schools?" said he. "Any one who visited the Vienna Exhibition, or any other exhibition for that matter, where there were school exhibits, will know what schools are in Sweden. Why, a child learns its letters and to spell in four languages all at the same time, and learns the whole much better than one and almost as easy. The girls learn to make their own clothes and to make bread, as well as the piano and deportment. At two in the afternoon they sing. Sing! I say, not 'squawk.' Sing so that visitors come to hear the music, just as they would go to a concert. I am speaking of elementary schools now. At some hour in the day the boys are called out for 'drill' in a gymnasium, by the 'Ling' system they call it, after some man who connected calisthenics to science. There is no rough and tumble business, but strict drill, by an officer of the army usually, who is detailed for that purpose. It is a wonderful performance, better than a theatre, and of infinitely more use. I am not a schoolmaster, nor the custodian of boys, but I know a school when I see one, and they can be seen here. These people are housed in the winter in close rooms. Ventilation is estimated by the cubic foot; a foot of air and a foot of cold, they come in together, but, nevertheless, as you may see, the people are sturdy and strong. Besides the elementary schools, or the secular schools, there is in every town of any size a technological school, and filled up too. Take Jönköping for example, an inland town, on Lake Wetter, with about ten thousand people. There is there a technical school or college equal to some of our best, so are there all over Sweden, and have

to be. What are these people to do on this poor peninsula that produces mainly granite, stunted pine trees and ice, with a few cereals, such as rye and oats? The people must go 'outside' to hunt for a living, and to do this must know something. In former times they were driven out by law, that is, a large part of the boys were, who found the law congenial because it gave a kind of warrant for robbing the coasts of the English Channel and everywhere else they could reach with their boats. This kind of business and recreation being ended, they must have schools at this day, and then when they go out into the world they soon learn the practical part of what they have already the rudiments and theory. Those that learn trades here stay at home, and now-a-days very few but the peasants or poor farmers leave this country. By the way, it is a strange thing, and a fortunate one, too, that the poorer a country is the stronger the people's attachment to it. This poor frozen land, with night twenty-one hours long in winter, and land that an American farmer would not think of cultivating, is to the Swedes home, and beautiful. *Gamla Sverige* is the refrain of their songs, the subject of their poems and traditions. The particular blessed spot of the earth."

—————The foregoing, taken in all, is the longest and most moderate speech my uncle has made. It is owing to the somnolent environment of the country. No one is in a hurry here. There is not quite as much "to-morrow" as with our Latin friends, but near it. To-morrow we start through the Gotha canal for Stockholm on one of the little iron steamers that run in that trade. There are about a hundred of them, and among these a dozen or more fine packets for passengers.

—At nine o'clock we cast off, and our little steamer began ascending the Gotha River, or a branch of it, because when we were fifteen to twenty miles out we came to a high hill, on which was an old castle in ruins, and on passing around that, came to where half of the river struck off in a northern direction to the ocean by a shorter route. Some farther on we came to the first rapids and went through some locks, or "sluices" as they are called here. This fall is a small one, of only ten feet or so, but in an hour more we ran into a great pool overhung and darkened with timber, and resounding with a roar like Niagara. This was the foot of the Trollhätta (witch's hat), the greatest waterfall in Europe, where 80,000 cubic feet per second come tumbling over ledges for a height of 109 feet. The whole rapids are 5,000 feet long, but there is one clean jump at the head of 40 feet or more. It is a remarkable place. Wild, weird, noisy and grand will do as adjectives, but what astonished me most was to see our little steamer, which we had abandoned, slowly "climbing the hill" at a right angle to the river. We followed up the boat, fearing it might diverge off into the country, but it kept straight on, lift after lift, until it was 110 feet above the dark pool from which it started. We all clambered up the hill and on board again, and started in the first stretch of artificial cut, or canal proper. The whole of this great work of the sluices is not made in the usual way of built up masonry. It is "carved out of the solid granite."

Now that we are in the real canal, I will explain something of it. It was not a very rapid work. They were 400 years in making it, or a part of it at the eastern or Baltic end. The western end, from Lake Wenner

to the North Sea, was completed in 1800, or nearly 300 years after the scheme was first considered, and after more than 100 years of actual work, some of which was lost, because there is a lot of unfinished cutting at Trollhätta, up alongside the falls, that was abandoned. The canal may be called a series of links, or sections, connecting lakes. Sweden is covered with lakes, and contains the two largest in Europe, Wenner and Wetter, through both of which the line of the canal passes.

The extreme altitude attained is 300 feet, at *Viken*. There are 74 locks, 37 on each side, and they are "there to stay." Some of the work looks queer and primitive to modern eyes, but, for the time, was done as well as human knowledge would permit. Telford, the great English canal engineer, was, for a time, engaged on the work. There were, of course, many engineers. It takes quite a number to last out a 400-year job like that.

It is 350 miles or so by canal from Gothenburg to Stockholm, which is 250 more than I inferred from the distances set down here. Swedish miles, contrary to the usual laws of expansion and contraction, have in this cold latitude lengthened out to six times our English one, a good thing to keep in mind when one is traveling here. The time is about three days in all, by steamer, and the trip is one of the most enjoyable that exists. The meals or food is in a measure *a la carte*, and you keep your own account in a book hung up for that purpose. At the end of the journey you foot up your own account, and pay the Mam'selle in charge. There is no cheating, or thought of cheating. There is no energy to waste on such things here. It is not agreeable. It don't pay, as we would say. The labor and anxiety of bargaining and watching to avoid cheating is a heavy

load, and these people seem to escape it somehow, as my uncle has already explained. It would be a curious problem if we could know just what part of human effort is directed to the avoidance of being cheated. It is a considerable part, and includes much more than we suppose.

The money here is at first a little confusing, like the "reis" of Portugal, but when learned it is a very plain and sensible system. The unit is a "kroner," worth twenty-six cents of our money. This kroner is divided into 100 parts called "öre"; so that when one is informed that a cigar is fifty öre, the statement calls for surprise. There are little silver coins of five and ten öre, also copper coins of small value, but the main currency is paper money of the most sensible kind I have ever seen. The bills of small denomination are about the size of a common letter envelope, 3 by 5 inches, and form a convenient pocket size. Their denomination is indicated by unmistakable marks, so there are no errors in counting. Larger bills are just double this size, so as to correspond when folded once.

I had no trouble in paying accounts, for, as my uncle suggested, I hand over the money at hand and the creditor takes out what is coming to him and returns the rest. No one wants to cheat you. No one thinks of such a thing.

This is the strangest navigation I have ever seen, and so remarked to my uncle as we were entering Lake Wetter. "Strange," said he, "you should be here some time when a squall comes down on this pot hole. Why it picks the water up and scatters it over the hill sides! You will not see a boat on this lake, and scarcely a sail. They do not dare to have them. Away yonder in the

distance you can see Jönköping. Ten thousand people there, and scarce a pleasure boat in the town. It is sure death to be caught 100 yards from the shore when a squall comes down. Comes down, I say, that is comes over the mountains down on the water, and sometimes strikes it flat, sometimes the other way, and at all intermediate angles. I have seen the canvas on a small boat out on the coast at Gothenburg, pulled away and standing straight up in the air; here it is worse."

I tried to think what was worse, and resolved never to do any boating on Lake Wetter.

CHAPTER X.

SWEDISH OMNIBUSES — A BUSY KING WHO EARNS HIS
SALARY—HORIZONTAL SUNSHINE—A LONDON STEAM-
BOAT COMPANY—TIN-POT STEAMERS.

—————It was not the intention to set down in these notes any thing of the ordinary routine journal kind, such as one finds in books of travel, but it is hard to avoid the habit. It is true that one is bound to see things through the glasses of his own occupation and estimate them accordingly, but then again there is the opposing fact that one is apt to pride themselves most on that of which they know the least. A common newspaper correspondent is never so happy as when he dips into science and machinery to dish up some ludicrous blunder, so by parity of reasoning a mechanic will want to describe scenery, the morals and manners of a people, with other things of which he has made no study. My uncle is an exception to this in two ways. He is ready to consider almost anything, and has considered almost

everything before, so I am proceeding vicariously in a great degree.

In Stockholm we stayed at the Rydeberg Hotel. Other people, not Swedes, go to the Grand Hotel. We wanted to see Swedes while here, so lodged accordingly, and I find here, next following the hotel note, the following set down from my uncle:

"Stockholm," said he, "is a center of refined dissipation, or, to be more exact, is a kind of large pleasure garden, open for four months in the summer. There is commerce here of course, and Government machinery of a very effective kind, but the people don't let either of these interfere with their pleasures during summer time. The city has the advantage of being half water, and the water has the advantage of being half fresh and half salt. That stream or current coming through under the great bridge there is fresh, poured out from a score of lakes reaching away back inland a hundred miles or more; turn around and you are looking at salt water. The 'omnibuses' are driven by screws, made of Swedish iron, and are the cheapest, neatest steam-boats in the world. Look at the reversing gear when you are in one; the single eccentric is thrown to its angle of advance, each way, by a shell between the eccentric and the shaft, the shell having a spiral slot to turn the eccentric, and slides on a feather or spline in the shaft. The end of the sleeve is turned into collars or grooves that mesh into a pinion, and that is all. There is one piece where we use three, and no running joints that wear out. If you have room among your baggage you had better take one of these boats along, they cost here just a little more than the iron is worth by the ton in England or America.

"There are parks, museums, palaces, hospitals, theaters, operas, pictures, and punch here. The opera is the finest in Europe, except in Italy. The palace, or Government house, is the largest in Europe. Stockholm is the Paris of the north in respect to pleasure. Some factories here, one machine works of goodly size, but even these and other business seems to be done for amusement.

"The King of Norway and Sweden lives over there in that immense building called the Palace; that is, has his rooms there and works there. Works, I say, because Oscar II has few subjects, except laborers, that do more work than he, and why not? A rusty king is of no use. This one here will not become oxidized for want of use. To begin with he is the most learned man on a throne in Europe, or in the world for that matter. He is a scientific man, a linguist and scholar, a writer, painter and poet, and knows how hydraulic cement is made. I heard him lecture on the subject one time, and have not the least doubt of his ability to draw up plans for a bridge as well as for a state paper."

—————Some days here has proved the correctness of my uncle's "facts," and added a great many more, but the time of departure comes, and it has just been decided that we will not go to Cronstadt and St. Petersburg because it is too hot; just think of that at 59-20 North. It is not heat so much as glare. The sun does not get up overhead so as to be shielded with roofs, hats and umbrellas, but "comes on" horizontally—goes sweeping around the horizon, giving out an intense light and heat too that is insufferable to a stranger. You see, on the streets, hundreds of white and yellow umbrellas, carried with the stick pointing at the sun.

They are worn as Sancho Panza did his front shield, and at the back, as he did his other shield, or pointed to the right or left.

I got out of my uncle another of his lectures by asking how we would travel from here and where go when we started.

"I want," said he, "to show you, while in this old country, some water service to stop your boasting of American steamboats. A steamboat and steamship are very different things remember. On rivers or inland waters, including even large lakes, you can build a first-class hotel on a vessel, but you can not send such a hotel to sea, so in comparing, here or anywhere, such service you must keep to deep water vessels, or the other kind.

"We will go from here down the Baltic in a steamer, not exactly a deep sea steamer, but near it, and, as I think, one of the best you will find in coast service in Europe. I don't know what steamer it will be, but the service all around here is good.

"From Copenhagen to Christiana, from Christiana to Malmö and Lübeck, Stockholm to Baltic ports, indeed all around, you will find service that puts the Steam Navigation Company of London to shame. This latter Company that owns fifty or more steamers going around their own coast and to ports on the German Ocean are tubs in comparison to the steamers owned here. They carry hogs, cattle, sheep and passengers on the main deck, and are suitable for the quadruped part only. From Hamburg to London, for example, they have a way of contracting "to furnish food," well knowing that no one, not even an "old salt," has stomach enough to eat on these steamers. They are worked commercially for gain, and with all possible disregard for pas-

sengers. Here it is different, as you have seen thus far. It is more like the American service, which is the best in the world inland, and nearly non-existent outland. The whole depends on competition. There is not a company in the world that would not carry passengers on scows and feed them on beans if there was a monopoly of routes. Passengers on the water get decent treatment because Nature owns the highway. There are no franchises granted in the sea.

“At the end of the American war, when the Swedes had but few vessels running to London, an English company put some blockade runners into the Gothenburg trade. These steamers were of the “tin-pot” kind, made for one journey across the Atlantic, in the Summer, on the assumption that one load of cotton smuggled out would pay for the boat. These steamers kept on a little too late one year, got their decks cleaned off, including dirt and cattle, and were blown off toward Iceland. One of them, by burning up all her deck hamper for fuel, got to the leeward of the Shetland Islands, a mere chance and an only chance. The owning firm failed, as it ought to have done before. There are not many of these tin-pot steamers around these northern oceans now. All but the very best hibernate in the winter.

“We often hear remarks condemning English builders for constructing cheap steamers. That is all nonsense, it is the owner who is to blame. We do not blame people for making swords, guns and torpedo boats, the avowed object of which is to kill people, not people who, as in the case of a bad steamer can keep out of her, but those who are marched up by force to be killed by such weapons. It is true the world has produced some men

and firms who would not, under any circumstances, build a tin-pot steamer, but that was because by refusing they got more of the other kind to build. Competition is what produces good steamers and good service by them."

CHAPTER XI.

ON DRAUGHTING—SWEDISH METHODS—EUROPEAN SHOP
PRACTICE—AN ENGLISH PLAN FOR FORGING SHEETS.

HOW TO DRAW A DUMP CAR—SWEDISH INK
PALLETS—LUBECK STEAMERS.

—————The present is as good a place as I will find in these notes to set down some views on draughting that have come up since we landed in this older country. Here in Sweden especially, there are some points of interest to one who has worried for months to know just how machine drawings should be made, as to the scheme, the amount of tinting, coloring and daubing that should not be employed, and out of it all, with some aid from my uncle, I have arrived at the conclusion, for one thing, that I know very little about the subject. Here in Sweden the drawings are the principal part of a thing to be made. The art is a congenial one to the modern Swede, who, very much unlike his ancestors, has become scholastic, wears gloves and glasses, and is effeminate. He is all the time speaking of his humble country, and all the time thinking it is the greatest country in the world, peopled with an exceptional race. I do not like to criticize in harsh lines a country and people, one of the best I ever hope to see, but, all the world has faults, and here there are

the objections named of a tendency to scholastic pursuits with a kind of contempt for the practical part of things.

My uncle, who sees everything, and forms opinions about everything, says: "These Swedes of our day are an example of the reversal of extremes. People never stop half way, they slop over, so to speak. The descendants of those hard-headed old pirates that once gloried in privations and exposure, have gone to the other extreme and do not even have the manly games, such as hammering each other in the face, smashing their fingers at ball games, breaking their legs at football. They caper nimbly to the notes of a lute and would all be instantly smashed by Charles XII, if that old chap would turn out of his grave for a second term."

This, however, has nothing to do with draughting, except the national trend is to do more draughting than hard work. It is well done—too well done, is a waste of time and has no application in construction, indeed rather the reverse. In England the art is strained the other way—is pure utility, and, as I believe, as nearly right as can be. They commonly use white paper, that is, paper that was white at first, pencil in the work and then trace the sheets in a clear manner and pile the original sheets away as lumber or destroy them. The lines are clear, in the right place, just enough of them, and no "mistakes." No one can describe what is meant further than to call it practical and sufficient.

Here in Sweden it is common to work from a center line, each way, and not uncommon to "figure from a center line," that is give dimensions from the axis, which is a piece of super-refinement to bother workmen.

Dimensions are laid down from the scale by measurement, and not made up as is common in England and America, mainly by computation. There is besides no commercial scheming of things to save expense, and as to time, that is not considered.

The cost of construction, even at the low wages paid and long hours worked, is more than in America or England, and as the workmen seem pretty well skilled, I imagine that most of the prime cost account lodges in the draughting and counting rooms, where there is usually a force about equal to that in the shop. The methods are plodding, and as they say in England, are "provincial," in so far as small implements and processes, but the work done is good, and I will say right here, that no bad work has been seen since we left home, except a little of what is called merchant work in England, and that is only rough—very rough. In Belgium, Sweden and Germany, indeed all over, there seems to be in iron fitting a tendency to extreme exactness and good finish.

To continue the draughting matter. I remember a story of my uncle's, relating to a skilled draughtsman who found himself stranded "out west," and made application for work at a jobbing works he came across. He worked off a small sheet in his best style, and handed it in as an example. The firm owners were much pleased and astonished, but doubted if their people could understand such fine drawings, and so said. They had some dumping cars to make, and wanted a drawing for that. The applicant was equal to the occasion and said he would draw the work without charge. He went early in the morning, hunted up a web of 52 in. Manila paper, borrowed a trestle board from the

pattern maker, and a framing pencil from the carpenter. In an hour he had ready a drawing, full size, fearfully and wonderfully made; figured with a blue pencil!

The carpenter would not wait until the owners arrived to inspect the drawing, but carried it off *vie et armis*, declaring it was the best drawing he had ever seen. The owners were much pleased and the tramp draughtsman was at once "installed."

Between the first and second drawing there is a wide range of degree. Both extremes are right; so are the intermediate grades, and in finding out and adapting lies the skill that owners want in a draughting room. The professors taught us the higher method, and left us helpless so far as pencil sketches on wrapping paper, a kind of drawings necessary in all machine works.

In England they have a method of taking out forgings that commends itself. Some one handy with a pen sketches the forgings, free hand, or without much attention to scale, with copying ink. The sheets are then put into a book and press copied, the original sheets which are merely foolscap paper are sent to the "smithy." The drawings thus made look wonderfully well. The figuring is "writ loud" and very plain and to the "forging" size, instead of, as is common and also unreasonable, leaving a smith to allow for finishing. He is not supposed to be skilled in that matter, moreover does not know where pieces go, and should never be bothered with making out finish sizes from rough dimensions. I was much impressed with this method of laying out forgings, and believe it to be a great step in advance of the old forging sheets, and much cheaper, also more systematic. At a large works in England they let us examine one of the forging books. It was

like a ledger, indexed, and in no case did the forgings for one machine require more than a page. There being no scale followed, large pieces are condensed and small ones enlarged. The figures set all right, and such figures I had not seen before. They were in imitation of roman type and clear enough for—a blacksmith.

In Sweden there was noticed a peculiar kind of ink dishes that call for notice. They consisted of a metallic box, pewter, I think, filled with red wax, and a curved glass dish, like the crystal of a watch, pressed down into the wax when it was soft. This makes a good strong job and wonderfully neat; but that is not the main point. When ink is to be made they breathe on the bottom of the dish to dampen it and then rub the ink without water until it is complete as a "paste," which is then thinned with water. One would think that under some conditions there would not be enough moisture from the breath, perhaps not, I describe what was seen.

—————The steamer down the Baltic was all my uncle promised, and something more. The engines were new and wonderfully well made, the feathering paddles made no jar and could scarcely be heard. The boat was clean, swift and orderly. The food was good, or rather was everything wanted, except the "smörgosbord" which is imperative in a Swedish meal. It means a kind of preliminary meal, eaten at a separate table, and consists of various odds and ends, such as anchovies, salted vegetables, caviare, hard bread, butter, bits of cold meat, and mainly a glass of "Bränvin" (burning wine) a kind of native brandy corresponding to German "Kümmel." It is a curious custom, easily

learned, and has the distinction of a name for which no etymology could be found.

We came to Lübeck in good time, and of this I will write farther on.

CHAPTER XII.

NAVIGATING IN A MEADOW—HANSE TOWNS—OLD CHURCHES
AND RELICS—AN IRREVERENT VIEW—OLD COINS AND
CABINET WARE—HOLLAND AND THE DUTCH.

—————When we got to the foot of the Baltic Ocean. I wonder why it is the “foot!” Our steamer was steered straight into a meadow! Away ahead we could see the chimney of another steamer, crawling through the grass, and at intervals high poles or masts traveling along in the manner of a peripatetic telegraph line. The sight astonished me, “paralyzed” should be the term perhaps, but language is not quite so strong here in this matter of fact old motherland. I looked up my uncle for an explanation. “This,” said he, “is not a case of running in a heavy dew, as Western American steamers are said to, it is only a lagoon, bayou, slough, or to be correct, is the mouth of the River Trave, which maintains a narrow channel out through its delta to the sea. That channel for twenty miles or so meanders through the grass, or “tules” as they call them in California. Those masts you see are on boats, towed by horses, and the contrivance is to clear the towlines over the tops of the willows that are planted on the banks of the canal. It is all very simple you see, except the making of the delta and all other things of the kind that require some thousands, five to a hundred thousand

years perhaps, to form. ' This thing of time, Tech, is a queer quantity, you don't know anything about time, that is, you have no conception not founded on years, a lifetime, or the period of history, in fact no one has, except a few scientific men who are for years buried in a fog of archæology, but this has nothing to do with the river. We are heading sou'-west. In a few moments we will be over yonder heading north, then some other way and in an hour or so will come to Lübeck. It is one of the Hanse towns, a member of the Hanseatic League, famous in commercial history, and the subject of various lies as well as a great number of queer truths. You can read it up at your leisure, and believe as much as you please. Lübeck is a wonderful old town that always had an eye to business, down to a century or so ago. They loaned money to the Swedes, who were eternally at war with some of their neighbors, and of course bankrupt. The Lübeckers exacted usurious interest with collateral security. Once they had a lien on the church bells in Sweden, and took them too, bells were then of more value than at the present time. We can make a good one now-a-days for ten cents a pound, but in those days two or three hundred years ago, they put silver in their bells, and even if they did not, the alloys were worth nearly as much as silver.

"Lübeck, after the Hanseatic League, went down as a commercial city. It is an inconvenient out-of-the-way place as a sea port; put there so the sea robbers could not reach it without some fighting on land, clearing away chains, dams and other obstructions for defense.

"Twenty years ago there was good grazing for cows and goats in some of the streets there, but just now there is a new lease of commercial life. Lübeck is alive again."

In time we came through the grass and up to the city, which is in fact a wonderful old place, very German, very comfortable looking, and fearfully old, to me at least. The churches or cathedrals here (I call all the large ones cathedrals) are of brick of great size, filled with relics, paintings and what not.

I am much afraid of having caught from my uncle some of his irreverent ideas in respect to old churches. He says "he would not give a good clean white painted wooden church in America for the lot." "This old trumpery," he says, "is a co-efficient of superstition, harmless now, interesting and even sacred to many, but that is no reason I must see it in that light. There is an old chest, made of oak wood bound all over with iron bands, hob nails, rivets and so on. That chest contains valuables belonging to the church, and is itself a relic of much value, that is, value to those who value it, I would not give ten cents for the lot. The iron is worth a cent a pound as scrap, and the oak might make firewood enough to cook a dinner. That is my estimate, but I have no business to thrust my views of the matter on other people. I think, however, it will be safe to suggest to a young man like you to look upon the whole relic matter as a humbug. I have a crack brained relation who labors hard in a machine works to earn money which he pays away for old worm eaten cabinet ware. He is rich and derives pleasure from being thought a "connoisseur," as the French say. Perhaps I am a little too utilitarian in these views, because there is to a mechanic, some pleasure in looking at an old machine—that old engine of Watt's, we saw in London, for example, but then an engine is a thing of practical use—a co-laborer with men and not the fancy of some old monk

who never earned enough money to buy the salt in his porridge.

"I have another friend who is a coin crank, and I sometimes look with compassion on his collection of badly made old chips—rough, hammered out, some of them, and worth just what the market quotations set down for the metal. He thinks they are old; yes, old for the Romans or even the Assyrians or Egyptians to make. For my part a modern coining press has more interest. By the way, just note down in that book of yours, the following proposition: Relic worship is commonly affectation, and a substitute for other information, which the worshiper has not. He tries to hide his defects in a pretended knowledge and admiration for that which is shut out from popular view and thus hides his own deficiencies."

I cannot help in some degree subscribing to these iconoclastic views of my Uncle, but their chief significance at this time is, that our journey will not extend to any of the old countries, nor do I care; that delta of the Trave has knocked the romance of age out of my head. When I want to see something old hereafter, a stone quarry will do. It will be of much more importance to cultivate some reasonable conception of the brief time mankind has been a tenant of this little planet of ours.

There is some machine work done at Lübeck, some ships built, one now and then. Fine Baltic steamers go there. There are no fights, brawls; no crime of any kind to speak of. The laws are supreme and the town is peace. A little Chicago—just a little—infused into Lübeck would improve it, and several large cargoes of Lübeck, sent over to "balance the trade," would much improve Chicago.

—————From here to Hamburg it is only a short way, and unless detained there too long I hope to persuade my Uncle to go to Holland and Belgium before we return to England, to Holland anyhow, where I can realize some pleasure from again reading a favorite book of mine, Motley's "Rise of the Dutch Republic,"—a kind of joke in this name, however, because Holland is not a republic, and certainly has not risen, at least not more than ten feet, and is the lowest inhabitable country known, one that has to be "pumped out" as my Uncle calls it. I hope to fill up sundry pages there, if we visit that country.

CHAPTER XIII.

A STUBBORN PEOPLE—FRANCS AND FLORINS—HOLLAND
TAKEN BY THE DUTCH—A RATIONAL BATTLE—
EMIGRANTS NEED NOT APPLY.

—————We made our way from Lübeck to Rotterdam, which, in many respects, is the principal "dam" in the Netherlands. How many there are no one can tell. The word is synonymous with our word "dam," and means a water barrage in a river or estuary. Rotterdam is at the mouth of the Rhine, or mouths of the Rhine as one may say, because it splits up like our Mississippi River. Rotterdam is a kind of commercial outpost of Germany, a place of landing goods for the Empire, and the wonder is that this Dutch country has not been somehow merged into the German Confederation—then again perhaps not, when we come to read of the stiff-necked nature of these people, who have never been subjugated after an infinite amount of trying by

great powers, notably by Spain in the wars of Philip II.

It is curious to think of, and to know, the energy and indomitable spirit that has, in the past, characterized these people of Holland or the "hollow land," meaning also Netherlands, or "Nederlands," the lower lands. The name is relevant, very much so, because a great deal of it is lower than the sea. In fact, a great deal of it was sea until "pumped out," as my Uncle says. Haarlem Meer, or the Sea of Harlem, was pumped out forty or fifty years ago. A portion of the Zuyder Zee (Cider Sea) has been recently pumped out, and in both cases a county or so gained. These pumping appliances of Holland are wonderful, both in number and extent, always of extreme simplicity and efficiency, and this is the principal engineering work of our day in Holland.

In times past this country was a center of the mechanic arts. Peter the Great came here to learn ship building, and some industries have lasted until now, but none that require much power. Some of my Uncle's views here will be in place, and better than my own, at least more comprehensive. I have a note as follows:

"Holland," said he, "is the queerest country in the world, or at least that part of the world we know. Somethings about it are unpleasant. It is a trading country, very rich, and the main business is to increase the number of florins. If you want to be 'skinned,' as we say at home, here is a good chance. We are staying at the 'Bible Hotel.' Just wait until the bill comes, no bible in that, but florins for this and florins for that. This insidious coin is worth forty cents, or a little more, just double the franc. Two hours from here, in Belgium, a franc will buy just as much as a florin does here. There are discounts, percentages and 'shaves' of one

kind or another for the stranger in every transaction. They live by percentage, and thrive on it.

"Then too, there is the cleanliness of which we hear so much. It is true, but not an inherent virtue. It is a forced one, a struggle for existence. Keep clean or die is the rule. How do you suppose they sewer a city like this, for example? I will show you before we go away how they go "up" out of their houses to dump garbage into the sewers. It is scrub or die, as I said before.

"The domestic or home economy of this country is the best in the world, and their external economy selfish—that of a trading community. Their management of Java is of the same kind we apply to lemons when compounding punch. They have famous tobacco and long pipes, and the care of these pipes is the first duty of the men here. I have seen a smith's striker with a long pipe, who divided his attention between the sledge and the pipe, with a large difference in favor of the latter.

"The whole thing can be summed up by saying that modern Holland has learned enough to draw the main part of their living from their neighbors. Those that do work, work faithfully, and have to. It is like the cleanliness. When fighting the sea and abominable weather there is no chance of shirking. They build some steamers here for pure contrariness. They also had the audacity to make compound engines, good ones, too, forty years before the British began it. They are the stubbornest people in the world, and don't want anyone to agree with them. Washington Irving's 'Knickerbocker History' is no fancy picture of the Dutch at New York. If not true it ought to be, and I am afraid is the best picture of Dutch natural traits we have. They were never conquered. Romans, Northmen, Spaniards,

and the rest who have tried it, soon looked up easier work; now there is little chance of it.

"No nation except the Dutch could keep the water out of here. It has taken a thousand years to learn how, and never could have been done by any other people less stubborn. There is no timber, no iron, coal or other elements of manufacture here, unless we count wind and water. The former answers in a way for power, and water is of little use on a dead level, but there is cheese and gin manufactured, and that reminds me of a toddy which must straightway be compounded."

Out of this medley one may select a good many points "anent" Holland, as the Scotch say. There are many more, and I am fully prepared to believe the story of the Dutch judge, who decided a case between two merchants by "weighing" their account books, and finding them "equal," ruled that the books "balanced," and that the sheriff must pay the costs of the suit for bothering the court with such a case. It was the last case brought before that judge, no one even ventured into that court again. The court had peace, so did the people, and Solomon was excelled. I also think of the Dutch general who marched his forces against the Swedes who settled on the Delaware in our early times, and who, on arriving in front of the Swedish fort, found that his army was "out of beer." A truce was called while this beer matter was settled. The Dutch went into the fort to get beer with the Swedes, and after a time, when the canteens were replenished, and the two commanders were ready for battle, they found it impossible to separate the armies. They had become hopelessly mingled and confused by exchanging hats and otherwise, so that when the two sides were drawn up neither dared to fire for

fear of killing friends on the other side. The dispute was then settled amicably by the generals, with no other aid than common sense and their pipes. It was the most logical campaign to be found in the history of the whole world, the only one that comports with common sense.

There are no spread-eagle fireworks and jingoism in Holland. That went out with old Van Tromp's broom, which he hoisted at his masthead and sailed up and down the English Channel with, after "sweeping" out all opposing craft about there. The Dutch are educated beyond war, unless it would be to keep savages out of their country. There is no spirit of smashing someone for "glory," and in that lies a civilization beyond any other country at this day.

There is no need of immigration laws here. "The Dutch have taken Holland" is an old saying, which admits of the qualification that no one else wants Holland, and no one else wants to go there. I imagine that no land is so free from "foreigners." Nature always provides some kind of compensating clause in her economy. A salubrious country, without great heat or cold, is overrun with strangers seeking climate, emigrants flock there, and are usually not a desirable class. They are the high and low. The industrial middle class, who own and manage business, do not emigrate; they have business at home. It is the speculative, the vicious, and undesirable generally, that form a great part of emigrating people. They do not go to Holland, and never will. They cannot cope with the Dutch in any way, would be beaten at every turn, and starve, if they did not freeze or drown.

—————One of the wonders of this country is "willow mattresses," not to sleep on, but to hold mud,

and build up permanent works, which there is no other material for. The plodding Dutchmen, while smoking, are always thinking and observing. They discovered centuries ago that Nature, in her grand schemes, had not neglected their country, but employed osier twigs and roots in embankments to retain water. When the Rhine is to be dammed or dyked, willow mattresses are sunk and mud piled on top, then harder material. The great dykes are made in the same manner, so are the common roads where they cross wet or reclaimed land. A row of mattresses is laid along, mud on top, then dry earth if any, and on top of all a good hard covering of shells, stone, asphalt, or something to withstand wear; when done there is both a road and a dyke; not only these but a continuous wharf. The ditches at the side, where the mud is scooped out, become a canal, used for all the common purposes that our wagons are; so we have a fine road, a water dyke, and a wharf all made at once, and not like our public works, with an eye to the next contractor, but there to stay for generations to come.

Schools are perfect—education everywhere, charitable institutions the wonder of the world; peace, quietness and stubbornness. If I were a Dutchman I would live here, if not a Dutchman would not think of such a thing. "The Dutch have taken Holland." As Rip Van Winkle says, "May they live long and prosper."

—————From here we go by Flushing to England again, where sundry pages of my note book, filled up long ago, will find some place in these notes.

CHAPTER XIV.

LITTLE BELGE—THE GIANT ANTIGONUS—BRITISH FORTIFICATIONS—MONS MEG—DOG TRACTION—A CITY
SET ON A HILL.

—————On the margin of my notes I find at this point a memorandum saying that my Uncle, who was called back to England for two or three days, left me to look at Belgium alone, which if not well done would have to be taken up and all gone over again on his return. This was a strain, of course. Here is the result.

—————Belgium, because of its small limits, and being wedged in between greater countries, is but little known in proportion to its real claims as a State. Three cities, Brussels, Antwerp, and Ghent, together contain over a half million of population, one half being in Brussels. Two million chaldrons of coal and 160,000 tons of iron are annually produced. Cloth weaving at Verviers occupies the labor of 4,000 men. One machine-making and iron-working establishment near Liege, the society Cockerill, employs over 15,000 men, and is the third largest in the world. The country is checkered over with railways, the system answering as a model for many countries who have tried to imitate it. All these things and many more are written down in official books, however, and we now pass to other matters.

Antwerp, where the giant Antigonus stood watch over the Scheldt and exacted toll from passing vessels, owes its name to a peculiarity of this mythical personage, who cut off the hands of those who would not pay, and threw the hands out over the walls of his den, saying "where they light let there be a city." "Werpen" in low

Dutch, or "Werfen" in German, is to throw, and "Antwerp" is "hand throw," but how the French make "Anvers" out of it is not so clear. Not only in France, but in Belgium, this last is the name. Ghent becomes "Gand" in Belgium or France, and the traveller becomes confused over these, like the writer, when he was in "Achen," inquired respecting Aixlachapelle; worse things have been done, however.

"How would you get along without speaking German, when in Belgium?" inquired a friend in America, where a considerable company were assembled. I waited some time before answering to see if anyone would correct him, and am yet convinced that everyone present thought Belgium was a German State. There is, however, nothing German about Belgium; it was sliced off from Holland in 1830, because of incompatibility of temper and other purposes, a divorce of international policy, and as a country is French. French is the language of the educated, and in Brussels is spoken almost exclusively, except among servants, who are for the most part Flemish. The Belgians are Celtic and Teutonic in origin, and may at this day, be called French, Flemish and Walloon. The aspect of the country, the manners, customs and nearly all which a traveller sees differs but little from Normandy in France, and only from the whole north of France in a greater prosperity. Coal, iron and England made Belgium. England in acting as a factor, was true to her trading instincts; there was an axe to grind somewhere; disinterested policy is not one of British peculiarities, and if she spends money, you may depend upon it, there is something to come out of it some way and some time.

The traveller in approaching Antwerp from the country is astonished to see two lines of fortifications of immense strength, one about 15 miles, the other, perhaps 5 miles long, encircling the city. The outer line being a chain of strong earthworks, may not be noticed, but the inner line will be sure to be seen, and is not unoften thought to be a city wall, which it is indeed. Bomb proof dens, magazines, guns and all the infernal machinery of war is hid away about these quiet looking grass-covered mounds, ready to be used at an hour's notice.

My vis-a-vis at table-d'hôte, was a major dressed in the neat and somewhat *outré* style of Belgian officers. I was introduced by the host, and as the officer spoke but little English, and I less French we managed to converse with difficulty, but this very fact, as is always the case, makes people communicative. They imagine what is told can not be repeated, because so imperfectly understood. One of my first questions was about the forts; "what are they for?" said I, "are the Belgians likely to attack one of their own cities? If the forts faced the Scheldt, I could see some purpose for them." The major hesitated, but finally leaned across the table and whispered very loud "Engleesh." I stopped to think, and in a few minutes and without another question, had what was then considered, and is now believed to be the meaning of this fortification of the landside of Antwerp, and I venture to here repeat the substance of my conjectures.

Belgium is the continental out-post of Great Britain and answers the purpose which Calais once served, only in a more extended sense. Antwerp is the continental rendezvous for stores, ships, men and war material in

case of war with Germany or France. In twenty-four hours an army can be moved from any part of England to Antwerp, and would at once be impregnably intrenched behind these strong earth-works. Immense warehouses stand along the water apparently idle, but all these things have a purpose. English gold has, no doubt, erected the warehouses and paid for the forts. It is all part of one plan reaching back to the time Leopold of Saxe Coburg, Queen Victoria's uncle, was placed on the Belgian throne, but there is no fault in this if all is as conjectured, and it is only one more evidence of England's sagacity and foresight, which has brought nearly a quarter of the habitable globe under her control and given her sway over 325,000,000 people. Belgé is the gainer. No right is abridged, no restraint imposed, and she has the whole military force of Britain to avail against aggressive measures on the part of Germany or France.

Going from England to the Continent, Antwerp is one of the first cities where a stranger may see the street traffic, watched over by the Virgin. At every crossing of importance in the older parts of the city a Madonna will be seen perched up on one or the other of the four corners, often on two corners. She is commonly symmetrical and brilliant in blue and gold, but sometimes crude and imperfect. The carvings are generally about life size, and of wood.

Tapers are lighted around these images on fete days, and in some cases when the donor of the Madonna or the occupant of the house can afford it, one or more burners are kept up each night, answering the double purpose of improving the street lighting, which is bad, and calls the passers-by to a thought of the ever pres-

ence of "Him who watcheth over all." This old custom, which measured by modern standards and especially from a protestant point of view, seems ridiculous and idolatrous, is, in fact, no such thing.

One who has risen at 5 o'clock on a winter morning in one of the cities of North France, Rouen, Amiens or Arras, and attended the churches to see hundreds kneeling on the cold stone floors, offering up their devotions, and then goes home to read through the morning papers and find that twenty-four hours had elapsed without a single offense warranting an arrest by the police, will be convinced that there are more ways than one of controlling and saving people from crime and disorder.

Antwerp has many things of interest to be seen. The pictures in the museum are justly celebrated. The zoological gardens, although not so extensive as at London or Paris, have something about them which renders them more interesting than either of the latter, the selection is better or the classification and arrangement more complete, at any rate one will go to the zoological gardens at Antwerp and the next day will want to go again. At Hamburg there are many more animals, but one trip satisfies.

Across the Scheldt, a mile distance, where a collection of wooden sheds stand on the bank, one can see the word "Gand" written up in giant letters; this is the terminus of the railway connecting Antwerp with Ghent.

Crossing on the ferry, and enduring a tedious ride of two and a half hours through the *Pays de Waes*, costing about one dollar, without anything of interest to see, will land a traveller in Ghent. Here there is a population of over 100,000; good hotels, good buildings and

in some respects a resemblance to Brussels. Houses, which coming from England one would take to be the residence of a royal duke, turn out to be occupied as baker shops, barber shops, groceries and the like.

What is the reason that in England a peculiar plan of buildings was invented which we in America follow out, and why is it that in France, Germany, Sweden, or as we may say, in nearly the whole of Europe, houses are arranged about courts, and people live on "flats" as we call it? I suppose there are good reasons for both plans. The query is, how is it that the two plans exist?

Here in Ghent, a given area of ground and a given expenditure in building, will house and accommodate twice the number of people that a like space and investment would in London or old New York. Everyone enjoys the satisfaction of living in a good house, which can be warmed at half the expense and no stairs to climb. The privacy is just the same as in detached houses. I have lived both ways and prefer flats in a continental house. The Scotch in both Edinburg and Glasgow build on the *etage* method, and the system may at some future time, say a hundred years from now, reach London. It will require about this length of time to introduce and harmonize a change of the kind in conservative England.

—————Every one, at least every one in England or America has heard of or seen the celebrated "Mons Meg," that wonderful old wrought iron gun mounted at Edinburg Castle. A gun of 20 inches bore, built of staves and then covered with rings of wrought iron, a piece of work that would puzzle many of our modern gun makers to perform. This gun, supposed to have been constructed in Mons, Belgium, some centuries

ago, stands as a proof how invention repeats itself. I had sat beside "Mons Meg" many a time ruminating. It was my pet antiquity; nothing seen abroad had the same interest, judge then of my surprise, not to say disgust, when in turning a corner in Ghent I found myself face to face or, more correctly speaking, face to muzzle with another "Mons Meg," an exact mate to its Edinburg sister, having so near as I could determine the same dimensions every way, only the present one is not fractured as the Scotch one is. This old relie which tells no mean story of the skill and ingenuity of the Belgians at a period which is remote in the mechanic arts, stands in front of a kind of market-place on a substantial frame. A glance in its cavernous depth showed a lot of children's playthings in the gloom at the bottom, a noble use of it. "The wolf shall lie down with the lamb."

We have sacred authority for assuming that "a city set on a hill cannot be hid," and certainly if this proposition is granted, Brussels is not likely to disappear from view. Perhaps no city in the world can with equal propriety, be described as "set on a hill." There are many cities on higher ground, even on mountain tops, but this is not what is meant. Brussels includes the hill, not only stands on, but surrounds a hill, and one of the steepest in the world to have streets running up and down its sides. This claim is made, with a full remembrance of English Sheffield, and half a dozen undignified attempts to sit down and slide, dating from my first trip down High Street in the city last named. The practicability of climbing the streets in Brussels, like many other human achievements, is a result of practice. A horse taken to Brussels from some level city could

no more climb one of those streets leading up to the palace and park, than he could ascend a fireman's ladder. It is learned by experience, and well learned too, for omnibuses filled with people are drawn up by three horses. Brussels is one of the most beautiful cities in Europe, and on the same assumption, of the world. This is stating it strongly, but is no more than giving an opinion which exists elsewhere than in Belgium. With one-fifth of the population Brussels rivals Paris in what may be termed attractiveness. The wealth of cities is as their extent, that is, the means to beautify and improve, is as the value of the ground, and this increases very regularly with the extent of the population. Ground has been sold in London at the rate of five millions of dollars for an acre, and in certain parts of Paris is no doubt worth five to ten times as much as the most valuable sites in Brussels. The beauty of Brussels is due to its romantic situation, the taste of a highly cultivated people, and to the great individual wealth of the citizens. Engineering science developed by vast manufacturing and mining interests, and the great railway system, has among the Belgians attained a foremost place, and on this science, modified or controlled by a refined taste, depends the development of a city so far as those features which render it attractive and beautiful. The genius of Hausman aided by the highest engineering skill, made modern Paris. The same causes are transforming London, bringing order out of chaos.

The Metropolitan Underground Railway is one of those creations which owes its existence to exact science, an undertaking which appalls one whose knowledge of such things allows them to conceive of what was to be combated and overcome in constructing such a line. The

railway system of Belgium was developed in the same manner; almost every line, station or switch, is a part of one vast and perfect plan laid down at the beginning, and from which no important changes were made, because of the high skill and scientific knowledge brought to bear in preparing the original scheme.

———To come down from railways to carts, and from science to an obscure branch of social economy, I wish to record the fact that the Belgians know how to manage dogs. These favored animals, which are little more than an expensive nuisance in most countries, are in Brussels raised to the rank of co-laborers with mankind, and earn their own bread, and judging from the expression on their faces and from their conduct in general, I have not the least hesitation in asserting that a happier and better contented set of dogs do not exist. In Brussels street tradesmen and costermongers have dogs to assist them in pulling their carts, and the arrangement, aside from economic considerations, is a very perfect one. The dogs do not go in front but are directly under the carts, safe from danger in the crowded traffic and take up no room. The cart can be as readily handled and will turn around in a space just as short as though the dog was not there. At the rear are a pair of legs, which rest on the ground when the cart stops, after the manner of a wheel-barrow; these legs are connected by a cross-stretcher, to which the dog is hitched with leather traces, which are long enough to allow him to walk directly under the axle. It is astonishing to see how they will manage when a heavy pull is to be performed. One may sum up all qualities of the equine tribe, that indicate reasoning power, and the whole will not be worth a compari-

son with these dogs. I have watched them for hours, climbed the hill alongside a cart to watch the dog and note his evident reasoning about the operation in which he was engaged. If he notices anything wrong, such as an obstruction before a wheel, he gives a bark to warn his master. When the cart stops, if tired, he instantly sits down or lies down to rest. If you go near the cart when his master is absent, the dog looks out to see what you want; if anything is touched a growl warns you, or a loud bark recalls the tradesman.

Bread, vegetables, milk, butcher meat, and so on are served by these dog carts and their number is legion. They correspond to the London costermongers and small tradesmen's carts except that a dog instead of a doukey is the propelling power. Dogs churn, pump water, and assist in many things besides pulling carts, and to a person who does not like dogs, it is a relief to visit Belgium and see that it is not their own fault if dogs are worthless, and that if men are foolish enough to give a share of their labor to support dogs, and will not even invite them to assist, no fault can be found. Miss McFlimsy's poodle, in actual outlay for provisions and attention costs \$100 a year, one fourth of what some poor men earn at hard labor. Many a poor man where children are half-clothed and denied the comforts of life, divides his earnings with several worthless curs, who never earn a cent, and not unoften destroy much besides their food. They manage these things better in Belgium.

———Brussels is not all set on a hill, as might be inferred from what has been said in a former place, the newer and we may say the main part, is spread out over a plain. Cities built on hills have all been much

changed by the modern railway system. Locomotives do not climb hills, and the result is that cities set on hills must come down to the locomotive. There are not a few cities that have been much changed from this cause, and Brussels is among the number. Business naturally gathers about the terminal or station of railways, and the accretion of population and buildings which follow upon the construction of a railway soon shifts the center of a city and gives rise to new interests, which change the complexion of everything.

—————Now that I am coming towards the end of these European notes, so far as they have been shared with my friends and the public, and see before me, and with pleasure, a resumption of my studies and work in my own land, but, with a very different view of many things.

I am now convinced that our progress in this world depends greatly, if not entirely, on what others know, do and think, and there is no longer a mystery to my mind in China's standing still for some thousands of years, with a wall of masonry on the Tartar side and a wall of bigotry on all sides.

I find engineers, mechanics, and men, much the same everywhere, with like faculties, powers and traits and have discarded my little gauge of personal prejudice for something I hope is more rational and true.

My Uncle, who was always looked upon as a kind of fanatic, I find is after all only a sensible man, who with his duties as an engineer has been able to observe and cultivate his mind without prejudice, and in connection with people of various lands. I also begin to feel charitable toward the professors when I consider the broader field on which their opinions were founded.

With these views I return to England, and here in London at the Castle and Falcon, the oldest city hotel, I sit ruminating over our relations, our environment, and our future, seeing in all a new phase, even the highest, for that calling which chance has thrown in my way, and to which my humble efforts through life must be directed. My Uncle, too, has got into a reflective mood, because this is nearly the end of our journey, the end of it indeed, in so far as a return to English speaking people. The journey to New York is nothing; a six-days' imprisonment with comfortable quarters and a big ship to rummage over.

I reminded my Uncle of a visit to Birmingham, Sheffield and Manchester, also Glasgow, set down in the original itinerary, to which he replied. "There are no secrets in British engineering, as soon as anyone discovers anything or improves anything, he straightway prepares a paper on the subject, and reads it before a learned society or sends it for publication. There are bigots here as there are everywhere, but not many in our line of business, and I see no reason for trailing over works in the cities you mention; however, we will go down by Birmingham and Manchester if you choose, and if you are very anxious, go over to some of the Scotch yards and see ships in construction, but it is of no use. Each ship has a blue book of specifications that you can buy, which contains more than you could see and inquire about in a month. Everyone is curious respecting ship-building in England, and it is no wonder, the art has grown up here in a wonderful way, and will likely remain here, because there is no chance to catch up in other countries. The British do not propose to stop and wait for that purpose. By the time the French,

Germans, or Americans have ships laid down to match those built here there is a new model to work to, an advance in dimensions or otherwise, that sets up a new standard.

“There is a deal of twaddle written and spoken about ship-building here and the causes that have promoted it. It is evolution, skill, and being let alone; some say cheap iron in England, but it does not matter where the iron comes from. As a matter of fact most of it is imported now, in the ore I mean. Look at the Clyde, where the winter days are about eight hours long, raining a good share of the time and some days so dark that the ship yards have to be lighted with torches all the time, it is about the worst place for ship-building in the world, but they learned how to build ships by owning and working them, and do not mind a Scotch mist.”

—————We went down to Birmingham. What queer places the English select for cities! It is a matter of accident. Birmingham is an accident. Set on hills, valleys, and all kinds of sidling ground. Its name too is an accident, Brumagen, it is called sometimes, but the name originally, was Borough Meecham, the Borough of Meecham.

The things made here would require a book to enumerate, mostly of metal, such as pens, buttons, guns, jewelry, hardware and the like. There is not much science in the manufactures here but a great deal of ingenuity, skill empirically acquired. For example, there is a way of eliminating imperfect spots on gunbarrels by welding in the flaws or spots. This is done only by the “barrel welders.” No one else knows how or cares to learn. A double barrel gun is made in a score of places by different people, each performing their particular part. It

is the old system, as we would say, the opposite of the factory system, with advantages and disadvantages, in both a social and a mechanical sense. It leads to individuality, and that leads to a good many things desirable, but it costs more.

Of one thing there is no doubt. No people work harder than Englishmen. They work "with a will," and produce also. If not, how do they compete with their German, French, and Belgian brethren that are almost within sight across the channel, and no tax to keep their products out, the continental workmen receiving about half as much wages?

By the way, I have been watching this wages matter all along and find it is not the wages that governs work, but the work governs the wages, that is men are paid in proportion to what they do or produce, but that is no discovery, because how could it be otherwise? All sell in the same markets, and if the Belgians can hire a man for 75 cents a day, how can the English compete and pay \$1.50 a day? This wages problem as commonly presented is bosh, it was better understood a hundred years ago than it is today.

—We went out to Soho where James Watt lived, or worked rather, because he lived and is buried at Handworth, about two miles away. James Watt & Co. now have a queer old shop at Soho, old in parts but not all over. In one section there are square cast-iron line shafts with long wooden drums nearly the whole length. In other parts all is modern. One old "grasshopper" engine was "put down by Jamie himself" as the man in charge told us. He said his father who had managed the engine had put new brasses in her, but he did not know when, before he was born forty years ago.

The sewage pumping engines at Pimlico, in London, were made at the works of James Watt & Co.—about as advanced practice as can be found at this day.

The British copper pennies are coined here by contract, Mathew Bolton, James Watt's partner, undertook this coining of pennies about 100 years ago, and it has gone on since. Just alongside of James Watt & Co., are the famous works of Tangye Bros., which we visited, and is here set down, all things considered, as the most advanced works of the kind in the world. My Uncle, who knew the works well, said: "They 'manufacture' engines here, others 'make' them. Tangye Bros. have built these works and made their money mainly by making American things and inventions, which were always paid for and acquired in a business manner. These methods you see here, which we call a division of labor, or the duplicating system, is an American idea in such manufactures, but there is no chance to apply it on such a scale as this at home. We have no such market, and it seems, do not want any. These men have five hundred million of customers, when one country stops buying another begins. There are nearly one thousand engines finished and in process here, counting steam pumps. There is nothing strange in a shelf thirty feet long, covered with cross heads piled up four high, or a pile of connecting rods that reminds one of a cane shed in Louisiana. It is only in proportion to the market and a result of natural prices for material, grit, and confidence. These men are Quakers, from Cornwall, brought up to believe that they are the equals of any people, and have proved it. Put a tax of twenty-five per cent. on their iron and they would fail in a year. Their net profits don't begin to amount to half that much."

—————The social arrangements of the men, about 3,000 strong,* are a revelation to me. They are like a government, have all kinds of internal provisions like a country Medical attendance, books, insurance funds, and the like, are all provided for. The general manager, Mr. George Tangye is a kind of leader for them; lectures, advises, and meets with them not as a master, out of business hours, but as a citizen. The master part begins and ends with the bell. I am acquiring some rational insight of the British engineering trades and the elements of one kind or another that make up that vast interest.

—————Manchester is a repetition, except that a finer grade of work is done, or rather the product is of articles demanding more precision. To comment upon industries here in an understandable way would add page after page to these notes which are now finished in so far as Europe is concerned.

CHAPTER XV.

ON A DOMESTIC TOUR—KNICKERBOCKER DUTCH—THE
MEMBER FROM CHATAHOOGA—AMERICAN RAILWAY
CARRIAGES—THE GENESSE.

—————The transition, or translation it may be called, from the college to the shop, is the goal to which every student's aims and aspirations tend. The monotony of study, embracing extraneous things, and the play of the laboratory, are like the training at a barracks before an army goes to the front. Everything one learns or does has reference to this change, and the sulphurous

*The Tangyes now employ about 6,000 men (1899).

smells, grime, and noise of the shop become pleasant odors, ecstasy and music, for a time at least.

I have had a little of both—good deal of the latter—and like both; the college because it is done with, and the shop because its labors and self-denial are congenial; but there is a surfeit of all things, and a new trip with my Uncle is an agreeable respite, well earned too, by hard work, and some nips and contusions of manual and pedal members, so that a letter from New York, “giving instructions,” was welcome and more.

My Uncle, in his usual didactic style, says:

“I want to start on a tour of observation next week and need you—don’t know which way, and it don’t matter; will keep to the water as a medium of transportation as much as possible. One is always cramped and disappointed by set plans for a journey. These belong to construction. Bring a two-foot rule; a short glass (ocular); some stout, rough clothes, and if not an inflection, leave that everlasting note-book at home.”

The above constitutes the “introduction” down to our start on the Albany boat, a cool seat to windward, and a short lecture on the Dutch, growing out of the name “Hoboken” seen on the western side at starting.

“The Dutch,” said my Uncle, “were at first exasperated, then amused, and finally pleased by the raillery of Washington Irving in his ‘Knickerbocker’ History of New York. Stolidity and smoke, both of them are good in their place, and the former, if we call it conservatism, is not a quality confined to the Dutch. Here abeam of where we sit is a steam engine driving this boat, becoming as antiquated as a Dutchman’s breeches, sharp gables, and galliots were a century ago. I am not complaining of a plain beam engine, on its merits,

so much as of its incongruity in modern practice. No Dutchman ever stuck to his long pipe with more tenacity than the Americans have to these low-pressure single-cylinder steamboat engines. The fact of their being knocked out at sea, in one round, fifty years ago, did not have any effect, and while we may admire the ingenuity and skill that has maintained the beam engine on American boats down to the present time, we must not forget that the same skill and energy, if it had been applied in other lines, as it now must be, might have set us ahead instead of behind the rest of the world.

“High pressure, wide expansion, and machinery under decks is the rule, or will be. On the *St. Lawrence*, from Montreal to Quebec, they have beam-engine boats, but the structure is of iron, under the roof, and otherwise a gainly improvement on the type we have here.”

This was a kind of revolutionary change of opinion for my Uncle, but he was right. Beam engines *had* many virtues, but their time is past.

—————The Hudson is a grand river, wanting only in “lineal dimensions,” as my Uncle calls it. “If this country,” said he, “had any concerted and practical ideas except how to get office—had any patriotism not confounded with the Treasury Department, the Hudson would long ago have reached from Albany to Buffalo, or to Lake Ontario, or both. Steamboats should go from Duluth to New York, and will sometime, when we have ten thousand less legislators, and the member from Chatahooga is not obliged to use his energies in securing an appropriation for the improvement of Catahoola Creek, so a scow can get up to his town and bring out the potato crop. What is a trans-country waterway to him, whose interests lie at Chatahooga? What has he to do with

Lakes Superior, Michigan, and Erie? He don't live there; besides, who can blame the member? He has not a neighbor or supporter who is not acting on the same principle, and cares as little for National matters, or any matter not in his environment.

"There are a thousand objections to a centralized government, and nine hundred and ninety-nine in favor of it. These quantities being varied from one side to the other by the character of the people, or rather the prevalent sentiment in a community. Put it into an equation, and add to the popular government side, virtue and honesty, the other member becomes minus, and is destroyed. Put there instead general selfishness and ignorance, and the popular government side is zero.

"We are getting into a position where National undertakings, or National anything, is impossible, except as political bargaining. There is very little National property of any kind, except for military purposes, but there is private property with National attributes. You see that train there on the shore; that is private property, also the way and the land beneath it. So its owners will tell you, at least. Yet the company, or those who own the road, have or may exercise what our legal friends call 'eminent domain,' that is, condemn and take private property, at an appraisement, for their own use. There is not a court in the land that will not at once say that eminent domain can be exercised for public purposes only. How then is a railway private property? I am speaking of National matters and the chances of a canal from the Lakes to tide water. That the Government can make such a canal or one across the Isthmus of Darien, who doubts? Make them honestly and cheap,

but where will the member from Chatahooga, and his friends 'come in'? That is the problem."

Waterways or canals are an old theme with my Uncle. One who has spent his life mainly on this element looks upon railways as upstart affairs, good enough for dry land and internal or home traffic, but only supplementary in the commerce of the world

———If old Hendrick Hudson came up here in the summer it must have delighted his senses to have looked out upon a scene like the one now before us. It was just the same two hundred years ago. The little trimming and cutting done by human hands has not much changed things, and never will. What has taken the mighty forces of nature millions of years to work out cannot be much affected by man's puny powers in a century or two. Just over there a great charge of dynamite knocked off at one time a hundred thousand tons from the rocks, and the result is scarcely visible—a mere speck.

The Hudson is done; no great changes will come in future, at least in the estuary portion, and that means nearly all, because when it becomes a veritable river, at Albany and Troy, it is not much of a stream, a country river, so to speak, and only a drainway with rapids, pools, and even cataracts; its principal function being to drive saw and paper mills and the like.

At Albany we took the train across the country, and across the best portion of it I have seen, to Buffalo. My Uncle, in searching for a place to stow his effects, became "cloudy," and I could see in his manner portent of a dissertation on railway methods. I knew he was no admirer of the very exceptional system in this country,

and after we had crowded into a seat with about fifteen inches of room for each, he began:

"Here," said he, "is a great box with cubic space enough in it to accommodate everyone, and not a place to stow your hat, even. People seated jam together, packed like sardines, half of them strangers in pairs; somebody just behind you looking down your shirt collar, and exhaling their breath around your head for second use in your own lungs, and then to be passed on to the next person. Twenty per cent. of the length of this train is made up with platforms and stairs to get up to the platform from the ground, and then one narrow door for both entrance and exit. These platforms belong in the stations, not on the cars. What's the use of carrying tons of them with the train when they had just as well be in the stations? It is all an adaptation, and awkward; saves the company from the expense of providing platforms at the stations. It is the idea of the old road wagon continued, and this is why the doors are in the ends of the cars.

"When traffic is dense, as it was at Chicago during the exposition there, they were compelled to abandon this system and fit up their trains and stations as is done in other countries. Just wait until we reach a station and then watch the result of this platform method."

I did so, and at Rochester saw all and more than my Uncle had claimed. A hundred or more persons wanted to get out, and another hundred or more wanted to get in. The forces met and chaos reigned. It required two and a half minutes to get from our seat to the platform, or floor of the station. The whole train could have been

emptied and refilled at Chicago or on any European railway in thirty seconds.

I am not quite patriotic enough to consider this a sensible system because it exists here. Time will change it, also will produce compartment cars, or those without a gangway down the center to accommodate peanut vendors; also will eliminate the commercial agent we call a "conductor," who comes around underway and causes you to hunt up and present a ticket as often as he chooses, generally every time the train stops at a principal station. If some one gets on he must be hunted up among the other passengers to collect the fare. Once it seemed right, now it seems crude and awkward.

—————Here at Rochester, the Genessee River tumbles over a cliff, and as my Uncle says, "becomes romantic." This, he informs me caused the selection of this place for a city, because of the water power available now employed for various manufacturing uses, especially grinding grain.

CHAPTER XVI.

DEACON BARTON—A CORPORATION WITH A SOUL—A QUESTIONABLE MILL SITE—JUNIUS JUDSON—A RACE PROBLEM—ELECTRIC TOWING—SCHEMES AND CRIMES.

—————On leaving Rochester, my uncle told a story, a very unusual proceeding for him, especially when the nature of the story is considered. I noted it down, briefly, as follows:

"Old Deacon Barton, a man who could hardly live to do business in these times, began here at an early day, fifty years ago at least, to make edge tools for carpenters,

coopers, and others. He was an ingenious, industrious, honest man, whose name you would find revered in memory like one of the old saints, if you were to inquire in Rochester now. He prospered, and after many years of toil and self-denial, had built up two factories; the upper one about the falls somewhere, and the other some distance down on the western side of the river.

"His tools were made honestly, of good steel, properly tempered, sold at a reasonable price, and 'warranted,' which meant that any faulty tool would be replaced, even if it were employed to tap turpentine trees in North Carolina. His name became a mark of good quality, and was known all over the country. But calamity came. The Genesee River got in an angry mood and washed the upper factory over the falls, into oblivion, with a good share, more than half, of Deacon Barton's hard-earned capital.

"He had left, a good name, a wide trade connection, and the lower factory. A great struggle and some goods bought from other makers enabled him to fill his orders and hold the trade. The lower factory was increased, and when it was fitted up so as to produce the product of the annihilated one, there came a fire and swept the whole thing off the ground. Nothing remained but a bed of smoking coals—not a pound of anything useful; and now I come to the part of this story I want you to observe.

"Away out in Ohio, then a pioneer Western State, was another tool-making works, a large and opulent company, composed of true men, as will appear. A meeting of the directors of this Ohio company was called; their mechanical manager was called in and instructed to go at once to Rochester and render any

assistance he could to Deacon Barton, and request him to send all his orders to the Ohio company, to be filled on his account, at a discount that exceeded the usual profits of trade; also to send for any goods he required at Rochester, and for aid of any kind.

"The foreman reached Rochester early in the morning, next day, and went down to the ruins of the burned factory, yet smoking and hot in places. A tall old man, with bent form and gray hair, was walking around the black spot, a picture of despair, the only person there. The foreman asked him if this was the place where the Barton Tool Works were burned, and where Deacon Barton could be found? 'This is the place,' said the old man, 'and I am Mr. Barton.'

"The foreman then told the story of his instructions, and the Deacon's head bowed lower and lower until the end; then, reaching out his hand to his visitor, it was seen that his face was covered with tears. He said, in a choking effort, 'I had given up, but I will try again.'

"That day and the next plans were made for a new factory, and various other matters arranged. It was built and succeeded wonderfully and quickly, so the Deacon at the end of a long and useful life went out to rest in the cemetery at Rochester, without a debt, and without having ever owned a dishonest dollar or injured a fellow man. I was the man sent from Ohio."

My uncle, at this point, like the venerable Deacon, was too full to add a comment on the changed spirit of our time, when the destruction of a competing works is too often regarded as good fortune for the rest. I knew what was in his mind, and could write it out here, but what would it avail? The place is or was familiar to my uncle, and he soon went on talking.

—————"On reaching Rochester, a common remark to all strangers is: 'Here is where Sam Patch made his last leap.' Few living now ever heard of Sam Patch. He was a courageous mountebank, who jumped from high places into the water, and wound up by jumping into the pool below Genesee Falls, and never came up again.

"There was formerly, forty years ago, and may be now, if we could see through the hoarding, a saw mill on the very brink of the falls, so near indeed that the log carriage when log timber was sawed, projected out beyond the end of the mill and over the boiling pool below.

"I remember when quite a boy, and long before the falls were fenced in for cupidity's sake, lying down on that log carriage and waiting for the slow feed to work me out over the falls, looking down into the raging cauldron below, and imagining poor Sam Patch's ghostly eyes looking upward. I could not move, and had to wait for the sawyer to 'gig back' and then get off with a cold shiver down the spine, to run away and never see Genesee Falls again until now, and not even now, because they are, as we are informed, converted into a peep show at so much a head for the privilege to go behind the high fence.

"Here was founded one of the important industries peculiar to this country—the manufacture of steam engine governors, or regulators which is a better name, as a distinct article of trade. It is near forty years ago since Junius Judson began to make his regulators here and sell them to steam-engine makers all over the country, much to their and his gain too, if he had let the lawyers alone.

"I am doubtful if he ever knew the real points of his manufacture, because he spent most of his time in discussing law suits, and 'graduated openings,' meaning thereby the shape of the ends of balanced cylindrical valves used. These were trimmed off to form what he called a 'double ogee,' a thing that had no importance whatever. The real points were first and mainly an organized manufacture of a job requiring workmanship far beyond the resources of any ordinary machine shop; and second, the high speed and consequent high angle of the suspension links, or increase of centripetal force, required to operate the valves.

"Previous to this, engine governors were made to swing around like children at a Maypole, and in a sedate manner that took no notice of a change of five per cent in the speed of an engine. Between these leisurely moving weights and the 'butterfly' valves, there was commonly a lever and a lot of loose-jointed tackle that would catch up after the engine had been diverging for some time toward a faster or slower gait. Judson altered all this, and the manufacture became permanent, as it should have done, and is now a wide and useful one."

—————"Here," said my uncle, as we pulled out of the station at Rochester, "we begin a country worth observing. There are apple orchards without end, a veritable apple district, cheese making and high farming. The land is maintained here, and is one of the few places where it is maintained. Schools and colleges are as thick as grog shops in Paisley, and the people among the best, physically and mentally, in the whole country, but not quite as good as farther west and adjoining, in what is called the 'Western Reserve.'

The name came from some kind of juggling about proprietorship and a concession from the State of Virginia, that owned the land to the same extent that the prophet Mahomet did, but that don't matter now; what I was going to remark is that hereabout, and thereabout especially, the New England emigrants came a century ago, and by drinking limestone water, working hard, and having a broad environment, their bones grew, their minds expanded, and their views broadened, until in the second or third generation they have become the best people on the continent, that is, they have in the highest degree industry, ingenuity, thrift, and education.

"These lakes we are coming to, I am happy to say at a reasonable speed, are a wonderful factor in the affairs of this country. Only being found out, however, in these latter years. The iron, copper, and timber at the upper end of the chain, more than a thousand miles from here, has made their importance mainly, but there is also a wonderful commerce to supply the Northwest—an empire of itself—and now it is proposed, as a parting stroke, to utilize the waters where they pour down at Niagara, 150 feet or more at a clean leap, to the level of Lake Ontario.

"Of this latter matter, people over-estimate it. What is it but money saving, and not much of a saving at that? A concentration of manufactures at one place instead of many places. As an increment to permanent wealth such works are a good property, and the effect within the radius of possible distribution will be beneficial. Remember, I am not disparaging the scheme at all but complaining of the extravagant and provincial remarks one hears about 'harnessing Niagara,' and the

dawn of a commercial millennium. It may save some coal, and reduce the price of that, but the price of coal does not depend upon demand and supply, when we come to think of it."

This view of the Niagara enterprise was new to me, and seemingly a mistaken one, but there are certainly some extensive social points to be considered in connection with concentrated and segregated manufactures. A diversity of pursuits seems to be an essential feature in the normal development of community, and manufacturing towns confined to a single industry are not of the best among municipalities.

—————We are now skirting along the Erie Canal, and I took the opportunity of getting my uncle's views of electrical propulsion for the canal traffic, knowing that he had been considering the subject. He was, I imagine, about to speak of it, because he had been figuring for some time, and referred to his note-book as he went along.

"This scheme," said he, "is what may be called a 'slop over,' and has for its principal object a franchise of special privilege, with some kind of provision to get control of the canal traffic, and prevent the use of horses and steam engines.

"The mechanical phases of the matter may not admit of solution at this time, but it is hard to see what the object is of generating power on shore and conveying it to a boat by a trolley wire; but they say 'we will get power from the falls.' Suppose they do; power is like potatoes, and will bring the market price no matter where it comes from, but the main thing is that water-craft of all kinds should be as the professors call it, 'auto-mobile,' and the objection to mules is in the fact

that mule power fails at the end of the tow path, as electric motors do at the end of the trolley wire. If accumulator batteries were possible in the case, and I do not see why they are not, then a boat might roam around at pleasure, but then comes the original query: why not generate the power on board? The limitations are, boats with a four-knot model, that cannot be expedited with an electro motor, or any other means, and a waterway that will not stand the 'swash' of more speed without damage. It is not a problem of power at all, and much less the kind of power, but of various other things, including an electric franchise.

"Governor Flower, who being a lawyer and a banker must know all about engineering matters, started this thing in a rhetorical section of his message last year, and is now one of the company proposing to use electric apparatus. I don't believe in it. Am sorry that I cannot, but there are so many who do, my opinion cannot matter much. There are two kinds of progress in the world, physical and moral, and it is about time that the physical part came to anchor until the moral part catches up.

"Powerful navies, flying machines, canals in Central America, and a tunnel under the Straits of Dover, six railways across the American continent, and fifty-million exhibitions seem mixed up with strikes, disorder, and an increase of crime, especially stealing. I can well mind when a certain penitentiary had 600 inmates. Now it has 2,600, and another thousand should be there that would have been convicted and sentenced if tried at the time when the 600 were in prison, so the proportion is six to one. Strikes, turmoil, corruption, discontent,

socialism, and the rest, are the product of physical change too rapid for social adaptation.

“This seems a long way from an electric canal, but there is a connection.”

CHAPTER XVII.

LA SALLE'S TRIP—NAPOLEON ANNIHILATED—ST. ANTHONY'S FALLS—CATCHING PICKEREL—A FISHY STORY—ACCLIMATING FRUIT—OTHER THINGS.

—————Hereabout, in 1681, La Salle crossed the lakes with his expedition to find out where the Mississippi River went to. Crossed but did not take to land as we believe, because it was a water expedition. He headed for the Illinois River, going to land somewhere near where Chicago or Milwaukee now stands. Twenty-three Frenchmen and eighteen Indians with canoes, guns, pemmican and various tackle of the frontier kind.

It was in the winter, and on reaching the Illinois River, they “walked” on the ice down to Peoria or thereabout, dragging their boats, and then paddled on until they came to Chickasaw Bluffs, and made at the Mississippi a camp, or “fort” then called, and named it “Prudhomme.” Then again on and on, paddling with a current running 100 miles in twenty-four hours, the weather getting warmer and spring coming in February, until they came safely to the mouth of the Arkansas River, where Napoleon, a considerable city, since stood. Here the Frenchmen went ashore and acquired a whole Dominion by setting up a pole with the arms of France on it, the greatest “steal” that the world has ever seen since the time of Alexander the Great.

Napoleon is gone now. The Mississippi made a swerve around that way and disintegrated the town, pulverized the substructure, inverting the superstructures, and moved the whole down to the gulf, perhaps in the eternal fitness of things to blot out the theft by the Frenchmen. The circumstance of the conquest is thus described in flowery words by Parkman the historian:

“On that day, the realm of France received on parchment a stupendous accession. The fertile plains of Texas; the vast basin of the Mississippi from its frozen northern springs, to the sultry bowers of the gulf; from the woody ridges of the Alleghanies to the bare peaks of the Rocky Mountains—a region of savannas and forests, sun-cracked deserts, and grassy prairies, watered by a thousand rivers, ranged by a thousand warlike tribes, passed beneath the sceptre of the Sultan of Versailles, and all by virtue of a feeble human voice inaudible at half a mile.”

Who can say after that there is no poetry in history, and that Buckle does not deserve eternal infamy for reducing history to a science?

———We took boat at Buffalo and here for the first time I inquired about my uncle's plans. He paid the bills, and I as a guest had no further privilege as to course and object than to inquire.

“We are going to New Orleans,” said he, “if money, patience and health hold out. I came around this way to show you two systems of inland navigation as different as chalk is from cheese. One written about, photographed, engraved until every woman and child in the land understands it—a system rising by evolution all the time onward. I mean lake commerce, or boats rather. The other, like Shakespeare's ‘Seven Ages,’

with a youth, boyhood, manhood, decline and fall. I mean the river boats and the commerce on them. The first, you can see and read about, and that note-book you may as well hang up for the present. No one will care for any opinions of yours on lake matters. They don't require your views or mine, besides you will need all your paper and energies further on.

"This steamer is typical of the whole lot, perfect in all appointments, including an opinion of every one on board, that it is the finest service in the world, and it may be, at least ought to be. A grievous cupidity and shameless utilitarianism has discovered that a hideous form of steam barges can earn more money in carrying dead loads than a regular steam-ship can, and now seek to debase the whole tribe with flat bottoms, porcine snouts, and covered-in decks, a kind of portable warehouse, called 'whalebacks.' If you see one don't mention it, let us pursue our journey in comfort."

I notice in these Lake engines the commendable feature of longer connecting rods, more accessibility all over, and what is certainly advanced practice in marine engine building. Here and there the sections seem fearfully scant, especially in the castings, but the factor of safety is no doubt as usual based on the distance between ports.

We went up to Cleveland, Toledo, and into the Detroit River, a most wonderful stream having most of the features of a river, and lacking some. It is like the Niagara, St. Clair and St. Marie Rivers, a connection between lakes, always clear, at one level and flowing in peace.

From Detroit, which seems to be the best paved, sewerred, lighted and managed city in America, we went

through the river and Lakes St. Clair, Huron and the Sault Ste. Marie Canal into Great Superior to Duluth, and thence to St. Paul by rail.

My uncle had intended to go on to St. Joseph, but changed his mind. "The sewer of sewers," said he, "the Missouri River has only one really useful function, that of creating sedimentary land. It is a builder, leveler, fertilizer and irrigator of endless cornfields, and generator of miasmatic effluvia, but it has made an empire withal. It is all over the country, first one place and then another, bristling with snags, spotted with sand-bars and a terror to steam-boats. When I was younger and knew less, I handled the puppet levers up there. It is not a pleasant recollection. We will take to water here and go down stream."

———St. Paul, St. Anthony, and Minneapolis are in effect one city, and hereabout is the most romantic place I have seen on the Mississippi River except at Lake Pepin. St. Anthony long ago, twenty years ago or more, was consolidated with Minneapolis, which was a great mistake, in so far as names. St. Anthony was on the eastern side of the river, had a beautiful name, while "Minneapolis," a combination of Indian and Greek, is perhaps the most ridiculous name on the continent—a childish and provincial conceit.

Here the Mississippi tumbles over a cliff 82 feet in all, and affords a wonderful water power. There is a deep stratum of yellowish-white sandstone of thickness not apparent, and over this a capping of hard rock like the crust of a pie. As the water wore away the sandstone beneath the falls, the shelving top rock would break off and fall into the pool below. This process went on continually but not very fast, until at great

expense artificial work was made by the Federal Government and the State to stop the falls from receding.

The soft sandstone is quite a factor in the development of the water power plants here. To arrange one, a tunnel for a tail race or discharge way is dug under the cap rock out to the desired site for a wheel pit; another canal is made, on top, to conduct the water from above the falls, and then a well hole is cut through the cap rock to connect the tunnel and canal. This forms the wheel pit. The soft sandstone becomes indurated as soon as exposed, and is not much eroded by the wash of the water.

It is as I said a romantic place. Just below is Fort Snelling, on a high picturesque bluff or "butte" as they would say in California, and there are the falls of "Minnehaha," which next to Minneapolis is the farthest from euphony that the namers could get. These falls are on the Minnetonka River, or creek, the waste-way for Lake Minnetonka, a dozen miles away, and here comes in a fish story, the first I believe in these notes.

My uncle had an engagement to look over the retaining works at the falls with some civil engineers, and as I never took much interest in static structures of any kind I concluded to go out to Lake Minnetonka with a picnic party of some local society. I was a stranger, knew no one and dropped into the procession mechanically. At the lake as soon as the train stopped, people scattered every way, some to a steamer, some to hotels, and many out in boats, until I stood alone staring around for company, then started to wander around the north side of the lake.

I came shortly upon an old Noah, who was pitching a punt he had been caulking, and asked him where I could

get a boat? "All out," said he. "Good day for pickerel." This excited my interest at once.

"Pickerel, that is the same as pike, fine fish, and plenty in the lake, but them fellers can't catch 'em," said the boatman, twirling his thumb toward a whole fleet of boats out in the lake trolling with long lines. "No pickerel out there, only some fool half-grown ones. The old chaps are lying in the shade along in the shore next the grass (bulrushes)." I soon struck up a bargain for the old punt, a trolling line about three hundred yards long, spoon hook and tackle. "Now," said the old chap, "I must go to town, don't mind them dern fools, just you go down round the grass there on the shady side, keep close in, hold the line in your teeth so you can row and feel; keep close in and you'll get more fish than the whole lot of them town fellers."

I had never seen a pickerel, never held a trolling line, but had fished a good deal, and would have made a small bet there was not a fish six inches long within five miles of there. I started out, run out the long slim line, took it in my teeth and rowed along "close in." Directly the spoon hook caught, I knew it would, and it came near hauling me over the stern of the boat. I dropped the oars and grabbed the line, when away back, at least a hundred yards, an agile fish sprang into the air in a curve, and disappeared. A tugging at the line, and the idea at last burst upon me, "I have hooked a pickerel!" Oh, the excitement! I hauled him in; about three pounds weight, and then I went "into business."

The old boatman was right. By keeping in and dragging the trolling line around the rushes I captured nine fish. All I could carry, and when the people col-

lected to go home, here was I with the only catch worth considering. I had a thousand questions to answer, and on the way in, laid down to old fishermen the laws of pickerel fishing: "shady side, close in, bulrushes and the rest."

My uncle met the train, and was amazed at the fish. "Where did you get 'em, Tech?" said he. "Out at the lake," I answered, but no mention of my catching them. Oh no, my uncle was too astute for such a story. I have not ventured it but a few times since, and never nearer than a thousand miles from Lake Minnetonka. There is a mental reserve about its incorporation here without an affidavit.

—————There is one hope of Minneapolis. It is only three miles from St. Paul, or counting suburbs less than two miles, and built all along the way, so it is to be hoped that St. Paul will some day swallow the Indio-Greek town and spread its name over all.

St. Paul is a solid old city, old as cities go in this land, and is at the head of navigation on the Mississippi River. From here to the falls, three miles or so, is a succession of shoals and rapids. There is a projected canal, as there is everywhere at this day. There is good reason for one here, however, where they make 9,500,000 barrels of flour in a year, and saw a large amount of timber, besides ship a world of wheat and other products from the Falls.

—————Going down to St. Paul, my uncle pointed out some fruit trees on the way, and said, "Tech, set down in that note-book of yours that vegetable life like animal life becomes acclimated, otherwise you may write that the first settlers here were fools. They thought nothing would or could grow up here

because it was so cold. Wheat for bread was carried from St. Louis, and now it is a wheat country. Fruit was not thought of, except some little wild plums about the size of olives, and the orchards were confined to Siberian crab-apples. These little red fellows looked delicious, and became edible after being well frozen and compounded with an equal weight of strong sugar. That myth lasted twenty years or more, and then apples, pears and other hard-wood fruit trees were planted and thrived, not at once but gradually.

"It is cold here, terribly cold in the winter, and hot in the summer, but that don't matter, climate is to people an accident. The harsher it is the more they admire it."

CHAPTER XVIII.

HOW A STEAMBOAT FINDS ITS WAY—THE TIPPECANOE
ESTATE—GENERAL HARRISON ON ANCIENT MOUNDS—

A LEARNED PRESIDENT—"WHEN DEAD HOW SOON
WE ARE FORGOT"—A TOBOGGAN FEAT.

—————My uncle, before he went to sea, was a river engineer, and always claimed that it was the best school in the world to teach a man what he calls "emergencies."

The art of emergencies, so to speak, is one contingent on human nature, an inborn trait. Some men are never so cool and composed as when they are in a "scrape." Then the intense activity of the mind in excitement takes the normal course of reasoning. In others explodes, so to speak, scatters, and becomes idiotic,

still training and example have much to do with the matter.

Steam-boating in the early times, and even now what is left of it on the Mississippi and its great tributaries, is full of "emergencies." When at sea one becomes nervous as soon as land is neared, but here a great boat that will crush like an egg shell, goes thundering along on the darkest nights, and in wild storms, between two shores within hailing distance, past snags and wrecks, over bars, around bends, in some mysterious manner no one can explain and never touches anything.

Before we reached St. Paul, I asked my uncle about this matter of steering at night, and did not get much satisfaction, his remarks were something as follows:

"That's the old question, the first one a landsman asks, and the last one a boatman answers, and one that has never been answered in a manner to convey much information. A pilot can't tell you how he finds his way; in fact he don't know, and does not dare to study about it. If he did he would get scared, and produce an 'emergency.' There is an intuitive perception of where you are that arises from a variety of things, that would make up a quadratic equation.

"First there is time, an unconscious measure of how far you have come from the last point; there is sound, not an echo, although that sometimes is observed, but a kind of reflection of sound from the shores, and there is the hill line or timber line always visible, except in fog; also the appearance of the water or reflection from it, and finally the feel of the boat. Any depth less than twice the draught is 'felt.' The vibrations change, the engines slow down, and the stern sinks or seems to whenever the water shoals, because of water piling up

at the head. I cannot tell you nor can any one else, how a pilot finds the way, but we will see all this as we go down the river.

"I don't like this St. Paul arrangement at all, you will miss a good deal. The Ohio River is the ideal one for steam-boating, comfortable, calm and beautiful at common stages, but outrageous in its fluctuations.

"Joseph Cowell, an English actor, who traveled here before Dickens did, described the Ohio River as a 'thousand miles long, a mile wide, and eighteen inches deep, frozen up for one half the year and dried up the other half.' He was here in the summer; six months later he might have seen sixty-three feet added to the depth. The rise and fall in the middle section, about Cincinnati, is sixty-three feet. I have steam-boated all day over cornfields in the lower river, and six months later seen a boat 'sparred' over the bar at the 'Grand Chain' at the same place, or near it, but it is a beautiful river. For eight hundred miles from where it begins at Pittsburgh, there is not a break in the green hills that form its boundary. Never did a river show out such a uniform bed. It is like a keyway in a long shaft. The sedimentary lands shift from side to side, but the whole width between the hills is the same, and even their fertility is invariable. Except at Louisville, there is not a rapid or ripple in the thousand miles that a child could not row a boat over."

I was of course much interested in this account of the Ohio, and managed its continuance. The river is full of legends, Indian and other. It is a frontier line between the North and the South, and I much regretted our trip had not been down the Ohio Valley, but as it was, a good deal was learned; here is the continuance:

“At North Bend, near Cincinnati, sixteen miles below, is, all things considered, one of the most romantic places on the river. I don't use that term in its common sense, for happily there are no romantic places in the way of rugged inaccessible cliffs, not worth a dollar a square mile, which seems to be the main characteristic of romantic places. Here all is peace, the lands are tillable, the hills climable, and the water everywhere accessible, flowing quietly and available for navigation and drinking.

“At North Bend is a pass about one hundred feet high, a notch in the hill between the Ohio and the Big Miami Rivers. The latter joins the Ohio six miles below, but at the ‘gap,’ the Ohio bends to the north and the Miami to the south, so the two rivers come within half a mile of each other divided by a ridge through which a tunnel was made about 1840, for the passage of a canal, but the main thing of interest to be pointed out here is that this was the estate of General Harrison, elected President of the United States in 1840, and harrassed to death by doctors and office seekers a short time after.

“It was a grand estate, lying between two rivers for a distance of seven miles, averaging a mile or more in width, a high ridge or hill of 300 feet elevation, extending all the way, except at the pass where the General's log cabin was situated on the Ohio side. This old cabin, a real log one, where the General lived, was burned down about 1860, the foundation yet remaining to be pointed out to the curious.

“Set down in those notes, which are no doubt to become permanent in the annals of this country, that the ninth President of the United States was and is a

stranger to his countrymen. They have never known much about him.

"It is a common impression in this country that the log cabin President of the United States was a wild, hard-cider candidate from the uncultured West. Never was there a greater mistake, General William Henry Harrison was, judged by fair standards, the most learned man that ever sat in the presidential chair. I know that most people will laugh at such a proposition, but it is true. Who besides, among the Presidents of the United States, has been a learned man? What are their legacies in the way of science, art, or even law? A politician is never a learned man, or to state it better, a learned man is never a politician. George Washington was far and away the most thinking man, down to Harrison, and he was both thinking and learned, he was a profound thinker, and his views were qualified by scientific attainments of a high order.

"In proof of this, there is on record a paper of his, contributed to the Cincinnati Historical Society about 1836, on the probable age of mural remains in the Ohio Valley, that is, or ought to be a classic in our language. I defy anyone to produce an essay that, aside from a wonderful diction, gives more evidence of analytical thought.

"On the General's lands at the summit or point of the ridge near the junction of the Ohio and Miami Rivers, is one of those ancient mounds, a most wonderful one, that General Harrison investigated in a true scientific way. It belongs to the class called military, a fortification in fact, enclosing seventeen acres. The walls are now in places more than six feet high on the inside, the outer angles being most of the way a con-

tinuation of the steep hillside. It overlooks vast plains of fertile land for many miles every way, had bastions and towers, also great cisterns to contain water or grain, or both, the inner walls of these being burned clay, and solid and hard, even now.

“The General had one of these excavated and cleaned, also made careful maps, not only of this, but other works of the mound-builders, which are thick thereabout, the great one at Miamiville being only a few miles away. His paper on the subject of these mounds, as I have claimed, is a classic in our language, also more cogent in character than anything in the *Monuments of the Mississippi Valley*, by Squier and Davis.

“The premises from which age was inferred was the timber grown, especially on the works at Fortress Point, on his own estate, and were most ingenious. It is many years since I read this paper, but the impression on my mind was such that I can repeat the substance of it now. The General says: ‘When the land is denuded of its verdure, as was necessary in erecting these vast works, and when, after their term of use, the natural forest began the work of again clothing the land with trees, there was a cycle of changes, such as is observable in all in this country. The first growth is not that of the surrounding forest, but is usually of one kind of timber. This yields to destruction by lightning, insects and other causes, and other species take the place of the destroyed trees. These changes go on until at the end of a period within some bounds of conjecture, the forest on the denuded area assumes its original character and diversity. At Fort Hill there is no discernable difference between the forest inside and outside the works. On the walls stand the same trees as in the

forest around, and of the same size and diversity, and from this we may gain some clue to the vast period that has elapsed since the works were erected.'

"Now I do not know that one sentence of this is exact, but it is the idea, clothed in less perfect language, and I ask who among our political Presidents has been capable of such a paper? General Harrison took a great interest in the speculations of his brother-in-law, John Cleves Symmes, the 'hollow-world man,' who is buried near by the General's tomb, and has on the top of a marble column at his grave a sculptured hollow globe. I do not know that General Harrison accepted the views of Symmes, but we know he was a military man, a jurist and a scientific man, who left on the country around his home a profound respect for his learning.

"Log cabin, forsooth! Those rough hewed logs plastered with mortar to fill the cracks, and roofed with riven boards, surrounded more learning and honesty than can be extracted from forty palaces, occupied by public men of our time, and think of the scant honor it brings to his memory!

"The General, by his request, was buried on an eminence near his old log cabin, overlooking the wide sweep of the Ohio, and visible for miles from passing boats. They built up a plain rectangle of brick, about four by eight feet, and put a large stone on top, also put a picket fence around the grave.

"The estate fell into other hands, much of it, and finally only one representative remained, the Hon. J. Scott Harrison, who lived at the 'Point,' father of the late President, and who by ill health could not attend to more than his own home. The fence around the

General's grave rotted down, the hogs got in, and, by rooting around the shallow walls, caused the brickwork to crumble, and our country came near the disgrace of having their most learned and virtuous President rooted out of his grave by swine.

"The governor of Ohio, by a communication to the State legislature, secured an appropriation to repair the grave and grounds, which was done about 1868.

"If a man feels constrained to do any great act of a public nature, and has any pride in the perpetuation of his name, he should at once get out of a republic, or out of this country at least, where as Rip Van Winkle says, 'when we are dead, how soon we are forgot.' Of course, one of my pursuits has a first regard for all kinds of learning connected with natural sciences, and why not? Nothing is more ridiculous than a man with his head crammed full of the Greek and Latin classics, walking around blind. The movements and forces of nature are to him a sealed book. He does not know what anything is made of. The animal, vegetable and mineral elements are to him a mystery. Dogs, horses and sheep, trees, potatoes and grass, wood, iron and coal are substances. Only this, and nothing more. Movements are to him profound phenomena, inscrutable mysteries, not catalogued with the Greek and Roman gods or the phantoms of rhapsodical nonsense. I do not know if General Harrison was a Greek and Latin scholar or not, or if he had acquired a knowledge of metaphysics and moral philosophy. But of one thing we can be sure, he knew how to construct a tunnel on scientific principles, also knew the essential elements that should enter into the administration of human government.

“One thing he failed in was the angle of repose, or the angle of stability for loose soil. One day his horse slid from the top to the bottom of an embankment, at Cleves, when the tunnel was being made there, fifty feet or more, without unseating the General. It was a fine feat, well remembered in the neighborhood, and will be told of to this day by old residents there, if any are left now, which I doubt.”

CHAPTER XIX.

LOW-PRESSURE STEAMBOAT ENGINES—ALSO COMPOUND ENGINES—AN OLD WATER-WORKS ENGINE—HOW CITIES ARE BUILT—THE FIRST OF STEAM-MOVED VALVES—
AN ASTONISHING CARPET BAG—CINCINNATI
AS AN ORIGINAL TOWN.

The account of General Harrison was extremely interesting to myself, as well as some others who were listening, but my main interest in the Ohio River was centered in its early navigation and steamboats, and the next lecture, to so call it, I deftly shifted to that subject, and have the following:

“My time of steamboating was long ago,” said my uncle. “Things are changed now, some for the better, most of them I suspect, but for wild, reckless, ingenious and dare-devil engineering the olden time never had or never will have a parallel.

“No one ‘picked up’ that trade. It required years and years, with youth and vigor to help. Nothing from books those times, you had to see, learn, feel and do.

“I named vigor. There were no balanced valves down to 1850, and it required some weight and muscle

to pull up a six-inch poppet valve against one hundred and twenty-five to one hundred and fifty pounds of steam. Not every one could do it with the leverage provided, and it was common to handle the throttle so as to avoid full pressure in the side pipes. By leaving the water cocks open and going a little slow, the exhaust valves were easier to raise, but it was no place for a weak man or a timid one. There were complications, too. These western men were not dumb or slow.

“There were condensing engines in those times, the *Natchez* on the lower river about 1848, the *Northerner* and *Southerner* in 1850; cylinders six feet bore, and a hold full of condensing apparatus, that was all pulled out in due time and stowed ashore. It was too clumsy, heavy and difficult to handle, expensive to maintain, and when balanced up against the saving in coal, it footed up like the Indian’s gun, ‘cost more than it come to.’

“The *Northerner* and *Southerner* were built at Cincinnati, I think, at least the engines were, and it was the pride of the people there to walk through the cylinders. A man five feet eight could do it with his hat off, and never forget it, but this is not all, we had compound engines those times, not sham ones or make-shifts but real tandem compounds, cylinders about sixteen and thirty inches bore.

“First was the *Hawkeye* with a heavy flywheel and clutches for the wheels. One night the men made a miss with the clutches, threw both out at once, and the engine with about three revolutions threw the flywheel, part of it through the cabin and the remainder down through the hull, the boat following in ten minutes and drowning about two score of people. Next came the *Clippers* No. 1 and 2 with compound engines, and the

Memphis. The last one I knew well and handled myself for a time.

“The compound engines were set amidships and took up a deal of room in a weak part of the vessel. The shaft, too, was a nuisance, terribly in the way, but they were compound engines just the same as the Elders introduced on the Clyde in 1870 and before.

“Cincinnati was a queer place those times, with more originality in an engineering way than could be found elsewhere on this continent. There is running there now a pair of water-work engines, poppet valve condensing, built about 1844, or fifty years ago, that persistently refuse to be beaten by others added since, down to the present time. There are half a dozen engines there, including a bull Cornish one eight feet bore, twelve feet stroke, all standing around these old steamboat engines. They go on however, a monument to old-time skill.

“Steam fire engines were originated there about 1850, and direct acting steam pumps with steam-moved valves were invented about the same time, by a man named Wilson, in Cincinnati, much to the consternation of a great pump combination, formed about 1872, when this fact became known, as it did in a very sensational kind of way, which I may tell of some time. Just now I am speaking of steamboats.

“They kept on building them larger and faster, until a speed of eighteen miles an hour was reached; not over a measured mile and by triangular shore marks as is done now-a-days. They had a better plan. For a time the packets between Pittsburgh and Cincinnati were the swiftest boats, and then came a competing line from Wheeling to Cincinnati as the western connection

of the Baltimore and Ohio Railway. Two boats left Cincinnati every day, and there was a shore mark, a pole with a pair of buck horns on the top, that was set up at the end of a twenty-four hours' run. Any boat that could pass the mark in twenty-four hours moved the pole ahead to her mark, and this was kept up until it got up to Parkersburg, Va., at the mouth of the Little Kanahwa River, or somewhere above there as I remember, and it would have been shoved up the river farther if steamboating had not fallen into collapse by railway extension.

"Railways did not carry cheaper, but faster, and with the advantage of going all the time, besides could manage Congress and secure the passage of all kinds of laws to harass steamboats, until one hardly dares to show its head in these times.

"Under the plea of taking care of passengers, the pilots, engineers, captains and mates must be licensed periodically, the boilers and hulls must be examined, the equipment is prescribed and every kind of paternal care exercised, but when the same passengers travel by rail, the Government turns them over to the mercies of the line, which may use dangerous machinery, ramshackle carriages, put incompetent people in charge and kill three thousand passengers and more thousands of their own men each year without let or hindrance."

—————At St. Louis we spent a day or two in looking around, and found the usual characteristics of all large American cities, evidence of its being built by "pressure from the outside," and to accommodate commerce.

In the old world cities were built first as the foundation, then their influence spread as from a generating

center. The wealth, learning and skill flowed from the cities outward. In this manner the cities were tolerably well completed and put into comfortable order first, the country following. Here it is the opposite. A rich country around, presses on the cities which are built in half baked form, without the sanitary appliances, improvements or municipal order, that the Romans knew two thousand years ago.

Building a city is no small matter, it calls for the sum of all knowledge that exists and something more, but even this is less difficult than to govern one, or so it seems in these times.

St. Louis is fast taking on the attributes of a city, and aside from coal grime, bad odors and a tendency to crawl out all over the country, is quite even with her colleagues. The high price of ground, and the speculator in "additions," are the obstacles that beset a city set on a plain. Land values are evaded by "moving out," and the facilities for travel permit this, so the municipal resources when spread out over miles after miles of border area, are not enough to pave, sewer and light the streets. If one wants to build a good city, a wall should be built around it first thing, or it should be put on an island or in a basin surrounded by hills, so it cannot "slop over," and flow out into the country.

This idea came first from my uncle, but I have for some years past made it a measure of constant observations, and find the truth of it in all cases, and don't think we will ever have a model city, until the land on which it stands belongs to the city itself. How far this system should extend I will not attempt to say, but every circumstance points to it being the only way of

building and maintaining in an equitable and successful way, what we call cities.

————— I was impatient to hear the story of the Cincinnati pump inventor, and so reminded my uncle of his promise one evening at the hotel.

“The circumstances,” said he, “are typical of some others, that will or may find their way into that notebook of yours.

“This Wilson was a kind of plodder, a cranky kind of fellow, who reasoned originally about things, and somehow stumbled upon the idea of amplifying the main steam valve of a pump into a piston, and then controlling its movements by a second valve moved by another piston. The same idea was extended in what are called duplex pumps, indeed these are the same thing, only the main valves and their pistons not only distribute steam to another piston, but also operate a second pump.

“The matter lies here; no steam piston can move directly the valves that supply it steam, some other force must be called in, sometimes a spring, sometimes a weight that goes on and completes the valve movement, but best of all a little leading valve that distributes steam to a second steam piston which moves the main valve. I explain these matters to show what Wilson discovered or invented.

“Later on, about 1872, the various makers of direct acting steam pumps in this country formed a combination, one of the first of the kind, to keep up prices. They put up a fund for litigation, retained the most famous patent lawyers, and set out to manage matters their own way.

“Out in Cincinnati there was a small firm, with small capital in money, but a tolerably large asset of skill

and wit, who were making such pumps. The combination scarce regarded this firm, and intended to crush them with some sham lawsuits when the time came.

“There was a convention of the pump combination at New York, and the senior member of the Cincinnati firm, who was not only then, but is yet one of the ablest hydraulic engineers in this country, packed up an old carpet bag full of papers, references, drawings and other ancient lumber relating to pump making in Cincinnati, and went to the convention. Of course he was not admitted, but on the last day, under an application for membership, which was assessed at several thousand dollars, he secured the right of being heard.

“He was a man of commanding appearance, given to laconic expressions, and the superior of any and all of the members in general education as well as on the subject of pumps. He quietly informed the convention that he was quite willing to pay the fee or assessment, as soon as he could see some equivalent that could be set up for his cash, but as the patents on which the combination was based were dubious, in fact invalid, he thought the sum of admission too high. This of course kicked up a commotion, and on being asked for his authority, the mild man from Cincinnati began to turn out the contents of his carpet bag on a table, and in a few minutes was admitted free of all dues, and appointed chairman of the ‘committee on patents.’

“I have left out a good deal, no doubt, remembering only the main circumstances, but it shows a wonderful phase of mechanic art in and about Cincinnati these times. Nor was this all, medical doctors there were famous, the wine industry began there; learning of one kind or another flourished. The North and South

met there, but the city was hemmed in all around by hills. It got hot in June and never cooled off until October. The water was execrable, and mosquitos devoured one in the summer, but the city has flourished, and is one of the best governed in America. They once voted three millions of dollars in a lump to pave the streets, and at another time built a railway to New Orleans, the Cincinnati Southern, that has a bridge, twenty-two miles long, over Pontchartrain, which we may see later on."

CHAPTER XX.

A MONOLOGUE ON THE MISSISSIPPI—HOW A RIVER OPERATES
—WHAT A MILLION IS—WHAT ONE GAINS BY OBSERV-
ING—A HOMILY ON HUMAN EFFORT.

—————The Mississippi flowed before us here in St. Louis. I had seen it before, but it looked dwarfed now, and crawled beneath the great steel bridge in a sullen, sleepy kind of way. I knew very little about the river, except the schoolboy lore, which is as near nothing as one can imagine, but I soon learned more.

My uncle had fallen in with some old friends, none of them steamboat men now, but captains nearly all. Some were merchants, some traders, and some nothing but owners of a lively recollection, tempered as one might infer with a strong flavor of imagination.

We were assembled on the hotel veranda, and after a pause, an old Captain Somebody, said to my uncle: "Camshaft, you were always eyes all over, saw everything, pried into everything, comparing, figuring, reading and remembering, now just tell us how the old

river compares with other rivers you have seen. I know it is a good many years since you took to salt water, as I always knew you would sometime, but you remember the river."

This was just what I was waiting for. The subject was a congenial one for my uncle, and I got out my note-book at once. Here are the notes:

"The Mississippi River is four thousand miles long, counting the Missouri, which should be called the Mississippi. It is the main stem as to length, but right here let me say the length of river has nothing to do with its size. Most people imagine that the water from the little lake at the head finds its way to the gulf. It is no such thing. If there was not a continual accretion of water all along the way, the river would run out and dry up long before it reaches New Orleans, or here even, like some rivers do half way up from their mouths. Here, Tech! do some figuring for me.

"Take a thousand miles of this river from here to Natchez a mile wide, and see how many square miles that will make. One thousand. Of course it would. Now tell me how much water it would take to cover a square mile one-fourth of an inch deep. One square mile—640 acres—27,878,400 square feet—divided by 48 to find the volume of the $\frac{1}{4}$ inch in cubic feet, gives 580,800, multiplied by 1,000 gives 580,800,000 cubic feet.

"Might just as well be half as much or twice as much," said my uncle. "The figures convey no figure or conception to the mind, but this is the amount of water that will evaporate in one hot day all over the river between here and Natchez, and if there was no accretion of water, the river would not reach there, but all be dried up on the way. There are more than fifty

rivers large enough to steamboat in, that empty into this great drainway. The water here is not what enters the gulf at all.

“The river down at Cairo is a mile wide, and averages about 90 feet of depth from there to New Orleans. It is the largest river in the world by volume and length, the volume is made up by a velocity of four miles an hour. A river may be five miles wide and have half the volume of flow. The Amazon toward its mouth is an example. But not in water alone is this river ahead. It carries more mud than all the rest combined. This I suppose you know from the mixture you have been drinking. Some one curious in such matters computes that six millions tons of earth is carried down annually. He might just as well have said sixty millions. As I said before, one cannot conceive of such a quantity, it should be expressed in mountains, farms, or square miles of territory.

“This mud comes out of the Missouri River, nearly all of it. The mouth is just above here, and will be here soon, at the rate it is moving down stream. The Missouri, contrary to all rules for river construction, is a rapid stream in an alluvial bed that shifts about so much that it keeps on top, which is a fortunate matter, otherwise it would cut a channel half a mile deep, and spoil all the cornfields along the route.

“The Mississippi Valley means all between the Alleghany and the Rocky mountain ranges, as we commonly say. It means about three-fourths of this country, and nearly as much in area as all the principal countries of Europe, Russia excepted.

“The sinuosity is unaccountable, for no one can explain why a river should go meandering around right

and left, making up in a thousand miles from here five hundred of lost distance. Fifty per cent is deviation. What this is for, what the cause and wherefore, no one knows, unless it is to prevent the whole valley from being sawed in two pieces, as would soon occur if the river was straight.

“As it is, there is a continual turmoil for thousands of miles, especially on the Missouri branch. People and towns are shifted from one State to another, and people on the banks and islands don’t know where to vote or pay their taxes. Islands come and go. The channel is first one place and then another. In my time you could always detect a Missouri River pilot, by the nature and vigor of his profanity. It was a distilled essence one might say, and it is just the same now, I mean the river, only freights are so low that a man cannot afford a new steamboat every fourth trip or so, the traffic has nearly ended, has also become dangerous in proportion, because boats have to pass pretty often to know where the channel is.

“Sometimes, or quite often indeed, the whole river scatters over the country, like the Skärgord in Sweden; scatters so there is no telling if it all finds the way back. It does not indeed, and here comes another idea about rivers, an idea that shows how we act and think on impressions instead of facts. Saturate a sponge and lay it down, a small trickle of water will run off, but the main body remains in the sponge. Fill up the sponge once an hour, and you have a figure of the basin of a river. The bed is filled up once a year, and the water passing here is a mere trickle compared to the whole volume, the surface water, so to speak. Dry out the bed

of this river, and it is not likely that a drop of water would run here for ten years to come.

“The Mississippi, as I said, is a mile wide from Cairo to Vicksburg, then grows narrower, and from New Orleans to the Belize is only half a mile wide, but a little deeper, not deep enough however to represent the continued accretion of water on the way. The subterranean feature of rivers is the most wonderful part. The rise and fall here and for a long way down is about fifty feet, then less and less, and only one-fourth as much at New Orleans, nine feet some will tell, but it is more—fourteen, perhaps. It has spilled out, gone up into the air, over and through the banks and levees, a good deal down the bayous, such as La Fourche and Plaquemine two hundred miles from the real mouth, but are mouths themselves in a sense.

“It is a queer river, a wild raging river with a watershed three thousand miles one way and two thousand the other, which multiplied together give six millions, in so far as giving one an idea of quantity or dimensions. A million is a nonentity, no one comprehends it, that is, it conveys no tangible idea of capacity or dimensions, it is only a figure to be split up into smaller factors, but this Mississippi Valley too is nearly in the same category.

———This was the longest continued lecture I had ever heard from my uncle, or secured for my notes, and was of much interest to the company. It also led up to a new idea or observed fact on my part, namely: mankind are unconsciously divided into those who deal with reason over what is seen, and those who go on inductively to deal with and reason over what is not seen, but implied. To some, nature is a book full

of hidden meanings and signs that to others are only visible facts.

A chemist, for example, in looking at substances, sees them as a combination of elements or gases. He is like a person traveling in a land where his own language is used. He reads the signs, the newspapers, hears all that is said, and understands it, but shift him to another land with a strange language, where his eyes, ears and tongue are of little use, and he is in the position of one without scientific knowledge.

He sees rivers flow, movement all around, but does not know what causes it, he sees rain fall, but does not know from whence it came or whither it goes. Plant life, animal life and physical laws, are all hidden behind an inscrutable veil, and he goes on groping in the dark, and is happy, so long as he does not know there is more to be understood.

Then again comes the question, what does a person gain by this faculty or qualification of understanding things? Answer—nothing. It is only others that gain. Education constitutes a man a martyr, opening to his eyes wide fields of effort and labor, solely for others, his little part being only the exercise of faculties that physically he would be better without.

Many a time have I thought how this prying, investigating faculty of my uncle had brought him a life of toil and labor, the fruits of which were scattered over a wide field, beside the little scraps that fell to my lot, and to these notes. Suppose instead that he had confined his time, thoughts and energies to making shoes, all alike, year in and year out, eating his poor bread in comfort, and never looked outside a little shop, or reached beyond his cobbler's bench, run the long race

happily, honestly, and at the end without enemies, laid down in peace, his corporal part to be resolved into gases, the existence of which he possessed no knowledge or hint, and his spirit to that goal where the best of us tend; would not this have been a more happy life? *Quien sabe?*

CHAPTER XXI.

AN INDIAN MASSACRE—A QUEER WATER-CRAFT—AN ESSAY
ON “BILERS”—A CAST-IRON DOCTOR.

—————Some time, perhaps not long hence, there will be classic ground, about the Falls of St. Anthony, in this upper river country. Indian stories and traditions are as thick as legends on the Rhine, most of them nearly as absurd, and all of them, I mean as a lot, are equally true. One, however, is true. That of the Winona massacre in 1861, when the Sioux Nation was called down from the North to be paid their annual stipend, and failing to get the money set to work and murdered a large number of people in Winona Valley.

The circumstances were so overshadowed by the great events of the Civil War, then transpiring, that people have forgotten this, one of the greatest Indian massacres that ever took place on the continent. An old resident of the country, we happened to meet, thus told the story, which I have set down in his own words as nearly as possible.

“Ingens are bad, no doubt, especially Sioux, that is, they are not afraid, and sullen, cruel scamps, but Ingen agents is worse. The money was sent out here from Washington for the Ingens, and they were asked to

come down here to Winona to be paid. By the time pay day comes around these fellows had no ammunition, no blankets, nothing to eat, and were just like a lot of half-starved cattle running to water and feed. Several thousand came to Winona, Sioux, Chippewas and others. The money got here in time, all in coin, but the cussed agents discovered that by sending it back to St. Louis and exchanging it for paper bills they could pay the Ingens and pocket the premium, which all at once had jumped up to twenty-five per cent or more.

"Now, just think of it. Here was a wild, starving crowd of savages, without anything to eat, and no shelter; squaws, children, old and young devils of all kinds, starving crazy, and believing that the Government had fooled them, and enticed them down here to die. I don't want to excuse Ingens, but just think of it. They kept getting wilder and hungrier, until at last out came the knives, hatchets and clubs, and the settlers were killed right and left. It was terrible. The soldiers soon settled the matter, and, as you know, thirty-five of the wretches were hung, all in a row, like blackbirds on a limb, and the pity was that an Ingen agent was not strung up between each pair of Ingens."

This matter I must leave to history, and also would willingly omit some remarks on "Ingens" by my uncle, that followed, but candor demands its inclusion now that the subject is open.

"The Indians of North America," said he, "are a strange race of wonderful diversity, but all with strong passions and a kind of rude manhood that is not common among other savages. They do not like to be lied to, and once they are deceived that ends their confidence forever. They look with distrust on white men,

and with good cause. We always manage to send our worst men to come in contact with the Indians, I mean in a civil capacity. An 'Indian agent' is a synonym with Jeremy Diddler, with cruelty thrown in, and the treatment of the Indian tribes must pass down in history alongside of negro slavery in this land of the free and home of the brave, or as a common rendering of it some years ago, which substituted 'slave' for 'brave.'

"Old William Penn had no trouble with Indians, neither had the British Government, nor has the Canadian Government. Go a hundred miles from here, across the line into Canada, and you will find there is no trouble with Indians, not the least, never has been, and never will be so long as they are treated in good faith. This is easy to understand. Savages, or, to use a better name, uneducated people, have certain traits just as strongly developed as what we call civilized people. They have confidence, respect and resentment, and passion just the same, but are wanting in penetration, or the faculty of divining the intentions and schemes of men skilled in arts mysterious to them, so they are always ready to believe and exaggerate whatever savors of deceit. The difficulty with our people, and all others who call themselves civilized, is that they want to thrust on other people their customs, religion, whiskey, guns, penitentiaries and general rascality.

"I have been among Indians a good deal, not here in this country, but among real Indians, natives of India, where there is no whiskey, no stealing, and, I believe, more religion than I have yet found among white men. I am not speaking of Mohammedan India, or Bhuddistic India, but the whole of it, or so much as is reached by

the common lines of travel. These natives here should not be called Indians any more than Italians or Russians. They have nothing to do with Indian, moreover are not like Indians, except as to color, that means the same in men as it does in horses."

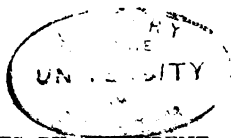
—————We finally got started on a steamer, to me a queer kind of craft that seemed to require some bale ropes and shores to hold it together. It was an example of attenuated cheapness, that cost per ton, or square yard, about as much, perhaps less, than would have built a house of like size on the land, still it was, except as to flimsiness, comfortable, convenient and steamed at a fair speed. The most annoying thing was the vibration. One could not read in the vicinity of the wheels, and everything loose seemed to be crawling about with the jar, but the scheme, so to call it, is ingenious withal. There is more steamboat for the money than any one would suppose possible, and that where money is by no means cheap or plenty. Allegheny pine, the white, soft, aromatic fir of that name, but mostly coming from the northwest, is used for almost every purpose. The whole upper works are of pine and paint, the latter tasteful and laid on thick, a fearfully combustible arrangement, which the chief engineer told me would burn up totally in five minutes.

Strangers who come here are always on the lookout for boiler explosions, myself among the number, and apprehension was increased by a grizzly old native in the hotel at St. Paul, who volunteered some history in the matter that was not of an assuring kind, and here let me say that even positive knowledge does not always protect the human mind from the influence of error. I know as well as a person can well learn when a boiler

will explode, or the circumstances under which it will "come away," to use a sailor's expression, but here I find myself influenced by the twaddle of an ignorant old fellow, who could not distinguish between a steam boiler and a saw log if the two were side by side.

"Bilers," said he, "don't explode now as much as they used to. There ain't so many of them, for one thing, and the men are too lazy nowadays to fire them, but we don't know any more about it now than we did fifty years ago, when the *Red Wing* went up, nor when the *Moselle* went up sixty years ago at Cincinnati, and left nothing but a hole in the water. The trouble is there are so many causes people can't find them out. The polarity of the water is one cause, crystallization is another cause, and decomposition of the water also, besides the bottom gets covered with mud and blows out. Some folks say it is too much pressure; well, there must be pressure around or else there would be no force, but steam pressure alone don't act like gunpowder, and hoist a whole steamboat into the air a thousand feet high. There is something more, and you can't get a steamboat man to subscribe to such a theory. It won't do, it ain't reason, a biler must have a weak spot. Why don't that go first, and when it does go a square foot of hole would let all the steam out in a wink or half a wink? You may talk about ingines and machinery, and all that, and I am bound to believe what you say, but on biler explosions your theory won't work."

I do not want to bring discredit on the venerable faculty of my *alma mater*, but there was one thing, and only one in the crude lecture above recited, that shook my confidence, and that was the weak point in a



"biler," and why a rupture did not end there as soon as "vent" was gained, unless relief of pressure permitted all of the water to flash into steam.

————— I went down on the lower deck, about two feet above the water line, and examined the engines. They were set on solid keelsons of timber, inclined about ten degrees to the crank shaft, puppet lever valves, wooden connecting rod, and between them a "doctor," who did the pumping for the vessel independent of the main engines. How this latter-named implement got its name the annals of the river do not explain, but it is a "doctor" everywhere. The word "auxiliary" had not found its way out West when these doctors were invented, but name aside I must set them down as the most complete thing of the kind I had ever seen. This view, however, as it must be here written, is not wholly my own, because I consulted my uncle on this doctor problem, and found as usual he had, at some time long past, put the subject through his crucible of analysis in the usual manner.

"These Mississippi steamboat doctors," said he, "represent the finest mechanical combination in the whole range of steam machinery. They are essentially a plain beam engine with a row of pumps on each side of the beam. The fulcrum frame is composed of hollow columns, the best form possible, performing also the function of pipes. There are supply pumps, I never say feed pumps since the Frenchmen have translated the name as *pomp alimentaire*, or "food pump;" there are bilge pumps and others, as many as are required. Everything is on end, consequently condensed into the smallest space possible, the strains are nearly direct on all connections, and there is one fea-

ture you may have overlooked, the action of the fly-wheel.

“On all land pumps having a flywheel the idea is to produce uniform rotation or speed. Of course the primary object or function is to regulate the stroke, and obtain proper valve motion, but, as said, the ‘idea’ is to secure tolerably uniform speed of rotation. In a doctor this is not looked for. There is not much room for a flywheel, and not much for it to do. It carries over the centers, of course, but the idea is to permit the steam piston to act directly on the water pistons, or as much so as possible, and this produces very irregular motion. In effect it is a direct-acting steam pump with a regulated stroke, and a plain slide distributing valve for the steam.

“These doctors are reliable in every way. They stand in open view between the engines, and the least derangement of the pumps is at once detected by the symptoms. They have more science in them than the whole auxiliary pumping outfit for a man-of-war. By science I mean common sense, the two terms being in a way convertible. The doctor goes on forever; I never knew one to fail. Everything about the pumps is in duplicate, for the double purpose of balancing forces and furnishing a relay in case of accident. You may find all the fault you will with the wooden engines, sheet-iron furnaces, and slam-bang valve gear, but be careful what you set down in disparagement of the ‘doctor.’ When I build a steamship or erect a large steam power on land, both of which events are alike improbable, I will first thing buy a steamboat ‘doctor,’ and then build the rest around it. It is fifty years old, without blemish in its reputation, and has never been

improved so far as I know. The first doctor was like the last one. The castiron eagles on the beam and the vermilion paint have gone out, but the main features are all there, and will stay there."

CHAPTER XXII.

A SAINTLY CITY—SIX MILES OF STEAMBOATS—A FALLEN CITY—CHARLES MACKAY ON THE CRESCENT CITY—A TOP DRAINAGE SYSTEM—A PAVEMENT FOR 200 YEARS—CARPET BAGGERS—RIVER PIRATES—A BRIDGE 22 MILES LONG—ON FLAT BOATS.

—————St. Louis, now a great city, founded in 1746, nearly 150 years ago, named, it is said, after Louis XV, who was no saint, indeed was quite the opposite of a well-regulated saint, and considering its environment, is a small city. It was transferred to the United States in 1804 from its French owners, and should now be the main city of the United States, and would be if there had been no railways, but these converted it to a way station. In 1852 there were 100,000 people here, now 450,000 (1895).

The old steamboat levee in 1860 was six miles long, and as many as one hundred and seventy steamboats have been counted there at one time. This seems an enormous number, but when one begins to count up water courses the wonder is there were not more steamboats. Let us count up this mileage, or the main part of it. The Missouri River, 2,000 miles; Mississippi, upward, 750 miles; Mississippi, downward, 1,300 miles; the Ohio, 1,000 miles; Red River, 1,100 miles; White River, 400 miles; Tennessee, 300 miles; Cumberland,

300 miles; Wabash, 300 miles, in all, of free water course, navigable for large boats, 7,450 miles, to which can be added enough in smaller rivers to make up 5,000 miles more. Suppose that railways had not been invented, and all this commerce was confined to river cities, what would Cincinnati, St. Louis and New Orleans be now?

New Orleans, the Crescent City, is like Babylon, the fallen. It is not the city it was at one time, and can never be again. Even if its commerce should under modern methods rise to the same volume as thirty years ago the place would in no sense be the same. The city has not declined so much as the people have. There was always much crime there, principally of violence, but this has given way to quiet rascality taught by the circumstances of war, and principally by the "carpet-bag" regime and the Freedman's Bureau, by means of which the carpet-bag officers gained their places.

"New Orleans," said my uncle, "had to be here. There had to be a city at the end of this mighty valley, otherwise no one not a double fool would ever have thought of laying out a town on a marsh at water level. Why they cannot bury one here, the dead are put into mounds, like flowers in pots. The drainage is on top of the ground, as you can see, and you can take up a paving stone out there in the street, dig down a foot or so, and then run a cane fishing pole down full length. You see that big building over there made of granite, that is the custom house, and has under it all sorts of contrivances to hold it up, including some thousands of cotton bales, so it is said. Well, that building has gone down about nine feet, and will continue to go.

“The St. Charles Hotel, where we are now sitting, has been held up pretty well. It is an old house, and has rested on piles, or at least partly so, also other known devices to secure flotation in mud.

“There are queer things here, many of them. Out there on Canal street you see it is paved with large squares of granite. I suppose you think they are flagstones or veneering. No such a thing. These stones are equilateral cubes, with six sides to wear out. As soon as one side is worn another can be turned up, but you need not watch for that operation. The side you see has been in use for thirty-five years, and is good yet. Six times thirty-five is two hundred and ten years of wear, and that will pay for quarrying out granite cubes in New Hampshire and carrying them here. A number of other streets are laid in the same way, and are the best paved in America.

“I suppose you are wondering where the drainage goes to when the river is higher than the city. It does not go that way. Behind here is a chain of estuaries or lakes, Ponchartrain and Borgne, connected with the Gulf and lower than the river, a little lower, but not much, but always at one level. The sewage is lifted by wheels back of the city, and thus given head enough to flow back to Ponchartrain, six miles away.

“New Orleans is not a river city altogether, it is in effect on salt water, and luckily too. If it were not the heat would kill one at night, unless the mosquitos had performed that office in advance. Six miles out from here is what makes New Orleans endurable in summer. Fine lakes of salt water, or brackish water, clear and cool, with all the comfortable inventions known to modern taste and contrivance, gardens, music, restau-

rants, theaters and other things, which a Frenchman alone could invent and maintain.

"Out of the old French and still older Spanish element here, coupled with the Southern chivalry, which people sometimes deride, came to this city certain attributes of an advanced civilization, not quite extinct at this time, but greatly impaired. These old Southern folk had their good traits. They would shoot each other sometimes, burn a nigger now and then, consume a large amount of liquor, and swear like the army in Flanders, but they would not 'steal.' The carpet baggers taught them that, and a very sorry lesson it proved to be.

"You perhaps don't know what this term "carpet baggers" means. It indicates a public officer whose interest in the country was carried in a carpet bag; came here to get an office, issue public bonds, sell them, pocket the money, and clear out. Go out about here to any city, and the trail remains in the form of a bonded debt. Cromwell in Ireland is the only parallel I can think of. Austin, Houston, Mobile, Baton Rouge were taken in. Here in New Orleans there was veritable war, cannon, barricades, the United States Mint turned into a fort.

"At the end of the great Civil War the white people were all 'tore up,' as they describe it. They did not vote, in fact did not dare to vote. The negroes were marched to the polls, and a stranger with a carpet bag became a mayor, others councilmen, and even a governor in this State, but to sum it up this political conquest of the South destroyed or stole *more of her wealth than was lost in the Civil War*. That is a strong statement, but is supported not only by facts, but admitted

by any honest and impartial citizen whose opinion you may ask.

"There were always pirates here, river thieves, that carried on a kind of Captain Kid business. They stole everything from fruit to fence rails, and from young chickens to horses. There was little of the common law machinery along the coast from Baton Rouge down, the code depending mostly on long-range rifles and revolvers. The 'chicken thieves,' that is, small thief boats, prowled around the river. They had 'dug outs,' little light canoes, to go ashore in. They would go under the wharves here, and slit coffee sacks through the cracks, and draw down a canoe full of green coffee, paddle out to the thief boat, commonly a small sloop, and come back for another load. The men were foreigners, Spanish, Italians and Portuguese mostly. When a planter saw one of these craft lying off his plantation he usually opened fire on them with a rifle. This was the only kind of stealing known here in former days, but they have fifty variations of it now, mostly within the pale of the law, but no better for that; in fact, worse. A thief under cover of the law, the church, or an army, is the meanest of all thieves. A real highwayman is a saint in comparison.

"The Belize is down a hundred miles or so from here. I don't know what the term means, other than the mouths of the Mississippi. There are three principal ones, and a dozen smaller ones, but fewer now than when Captain Eads built the mattress walls there, called jetties. He concentrated the water, caused a scour in one of the main channels, and produced twenty-six feet of water, instead of fifteen, or so, that existed before. Very few go down there, there is noth-

ing to go for. The great river dies there, flattens out like a jelly fish exposed to the sun, and the waters flow into the ocean to begin a new round of fog and clouds, that are converted to rain at the head waters, four thousand miles away. There is the same amount of water all the time, but it shifts around."

—————The greatest feature of this country here, and for two hundred miles above, also for an unknown distance each way, is swamps. Going out to Lake Ponchartrain, six miles or so on the shell road, a veritable road made of shells, the swamps are on each side. What it means I cannot make out. That the land and water should have arrived at levels so nearly the same, and remain there for ages, as the great trees attest, is a strange thing indeed. The lakes, or at least Ponchartrain, are only a little lower. Straight across this lake, twenty-two miles, the Cincinnati Southern Railway has driven piles and built a bridge. Think of a bridge twenty-two miles long, but it is there. Raise the bed of this lake a few feet, not more than six, and, except a channel here and there, it would be a "swamp," and bear huge trees, be covered with jungle and reeds, beneath which, and among which, would swarm all kinds of life of the least desirable kind, serpents, mosquitoes, alligators, snapping turtles, and other things of a creeping and venomous kind.

—————I heard the term "flat boat" several times since coming into the Mississippi Valley, and had some idea of its meaning, but not very clearly. Last evening a man remarked: "That was in flat-boat times," indicating an age when this species of aquatic craft flourished, so I lost no time in asking an explana-

tion of my uncle, who was good enough to go to the bottom of the matter.

"A flat boat," said he, "is a Western invention, is a punt a hundred feet long, or, to be more exact, is a rectangular water-tight box, sixty to a hundred feet long, eighteen to twenty-two feet wide, six to eight feet deep, and is the cheapest means of moving freight ever devised in the world, if we except rafts, and even these need not be excepted, because they float in the water, while a flat boat conveys its load dry.

"Of course you never saw a flat boat built and never will. They were an evolution of this valley, and not known elsewhere. Get out that notebook and I will go over the process. It will not involve the calculus, or quadratic equations even. I will not touch on radiant matter, electrical hysteresis, or the fourth dimension, still the art deserves a place in that notebook among other imperishable facts to be dug out at some future age.

"To begin, suppose two or three men that you would call farmers living on one of the small tributaries of the Ohio River, for example, have during the winter months 'cleared land,' and in so doing have prepared a hundred cords of hard wood, that is, beech, maple and hickory, also have some bacon, hoop poles and tan bark, perhaps corn, pumpkins, dried fruit, shingles, cedar posts, or other commodities to sell. These things are worth money at Cincinnati, Louisville, or other cities on the river, and worth nothing whatever on the ground where produced. Steamboats cannot come there, and hauling is out of the question, so these men take their axes and go out into the forest to hunt up a 'gunwale tree,' that is a tulip or poplar, as they call it, large enough to

make a pair of gunwales, or 'gunnels,' to construct a flat boat. Up to sixty feet long, or even one hundred feet long one tree will do, but the longer gunwales have to be spliced.

"The tree is felled, and squared by hewing to lines, twenty or twenty-four by sixteen inches. This beam, weighing tons, is then raised six feet or so by rocking it on a crib on the seesaw method, and is slit edgewise into two parts with a whipsaw. These gunwales, 8 by 20 inches, are then dragged down to the water's edge, and set on their edge on launching ways. Each end is beveled off for the rake, end beams are framed in, so also cross timbers about 5 by 8 inches laid flat about six feet apart, tenoned and draw pinned into the gunwales four inches below the edge. Next there is pinned on these 'stringers' about $2\frac{1}{2}$ by 6 inches, running fore and aft, three feet apart. These will be one and one-half inches below the gunwale, which is then rebated about two inches back to let in the bottom planking, one and one-half inches thick, put on crosswise, everything pinned with hard wood trenails about one inch in diameter.

"The boat is then caulked with tow or oakum, butt and main seams pitched with tar, and is ready to launch. The gunwales are raised with levers, some greased slide boards put on the ways, and the immense shallow box is shoved into the water, and now comes a puzzle. The boat is upside down, and must be turned over. To do this some planks are set up along one side, and the bottom is loaded with stones and earth, stones alone if there are enough at hand, until the boat is sunk below the surface of the water several inches, the projecting stones indicating buoyancy. This nonde-

script creation is then moved into deep water, in a 'hole,' as they call it, and a number of people standing on the bottom begin, as fast as possible, to pitch the stones to the side having the guard plank. In a few minutes that side begins to sink. The stones all slide over to the low side and the boat turns over. The people in the meantime rush to the high gunwale and crawl over, or else swim out of the way, which is the true conventional custom. The boat is then towed back to the shore, baled out, and is ready for studding. These are mortised into the gunwales, about three feet apart all around, the side planking is put on and caulked.

"If to carry dry freight, a roof is sprung on, that is, curved about half an inch to a foot, the boards crosswise and full length. If cord wood, timber, hoop poles, staves, coal, or other freight not needing cover, is to be carried, the boat is left open, and is ready for loading as soon as the sides are put on. The draught will be two to three feet for a dry load, for timber of any kind about four feet. If for coal, stone or other mineral, the draught may be nine feet.

"A 'check-post' is set in, and braced by the cargo. The sides are held out against external pressure in the same manner, indeed the whole thing is only a water-proof covering for the load. An immense 'sweep,' fifty to sixty feet long, is mounted at the stern for steering, and a pair of shorter sweeps for pulling head-way, which in extreme cases may reach half a mile an hour.

"This great ark floats to her destination, steered carefully. 'How?' you will ask. In the strong current and slope of the river the boat crawls through the water,

not as fast as a North River steamer, but at a rate of one to two feet a minute. How and why you may find out for yourself. The main thing is stopping these boats in a current of three to six miles an hour. To do this requires skill, dexterity and good judgment. To land, the bow of the boat is set quartering down stream. A rope 200 to 400 yards long is coiled in the stern of a skiff. A good man takes the oars, and the most active and coolest one at hand takes charge of the line, which runs out over the stern as the skiff is rowed ashore. As soon as the skiff strikes the shore the rear or line man turns over the rope coil, seizes the free end, springs past the oarsman, and runs up the bank to find some solid object to make fast to. A tree or large root, or some immovable object. A 'let go' hitch is made, and the signal given to begin 'checking,' which is a dangerous operation. About three turns are made around the check-post, and the line fed out under such tension as it will stand. The smoke will sometimes rise from the post, caused by the friction. The boat begins to swing, and at the same time move toward the shore, and is gradually brought to rest with the bow or end up stream. If there is too much delay, and remember all this has to be done in a minute or two, the check man cries 'let go,' and the line man casts off, comes on board, the line is hauled in, and another attempt made after the boat can again be moved out and laid in position.

"This is often done in the night. Landings are made, indeed must be made, at city wharves. The line man must find a ring bolt, the water-wheel beam of a steamboat, anything in sight to make fast to, and he does it. Protests do not go, he will hitch to anything, fight to retain his hold. Remember, he must be ready

to let go at a signal from the boat. If his hitch gives way he is disgraced, if he cannot let go he is disgraced, if he falls in the river and don't drown he is disgraced. The ethics of the trade are distinct. You may laugh, but I would rather go aloft to furl a royal in a gale than to go out with a flat boat check line.

"At the end of the journey the boat was taken to pieces and sold as sawn timber. The cost in former times was from \$1.00 to \$1.25 a lineal foot, and the wrecking value is half as much or more. It is all done now; railways reach the inland streams, timber is too dear to build flat boats with, and the men who operated them are in the cemeteries."

I am beginning to think that water-craft, that is, human craft on the water, is much the same as it is in animals. It is absorbed in an insensible way throughout a term of years, or a lifetime, and is not a specific thing to be learned, like building houses or shoeing horses. A kind of second nature. Put a water-skilled man on a steamer, a ship, in a boat, on a raft, or a life buoy, it is all the same. He knows the traits and trends of the water, and how to keep on the surface of it. Geometry, dynamics, mechanics, or even a knowledge of Greek and Hebrew, will do him no more good than a heathen's talisman, unless he has been trained to the water, on and in the water. It is like gymnastics and circus riding, no one can do even a little of it without training, and they must begin young. There is a touch of heredity in it, too. I do not mean what is called navigation in its technical sense, finding the way in open seas. That is science, and not a very abstruse one at that, but how to clubhaul a ship, or land a flat boat, is another matter.

CHAPTER XXIII.

A PITCH-PINE COUNTRY—A SCREED ON SLAVERY—HOW TO
SET A TELEGRAPH POLE—BORING OUT A FLY WHEEL—

HOW TO SETTLE A NEW COUNTRY—

PACIFIC COAST.

—————At breakfast one morning my uncle announced his intention of going straight to New York.

I was not sorry at his decision, because it was obvious he felt like Marius at the ruins of Carthage. His old remembrances were of a brighter period in this country, before the carpet baggers and the railways had changed all. I knew his estimate of what we call progress, and it was not all in harmony with popular opinion. I therefore asked some questions about his intended route, remarking that we would certainly pass through a rich country until we left the Gulf level.

“Rich,” said he, “look out for pitch pine, white clay and water. No one knows why there is not fifty feet of sedimentary deposit all over the country, especially from here to Mobile, which we will pass through, and perhaps there is, somewhere down below, but on top, pitch pine. This tree one may liken to the mangy dogs of Cairo, in Egypt, I mean, always associated with poverty. When it is not pitch pine it is cypress and water, but of good healthy timber and growth of anything, don’t hope for it. You will not see an acre of good warm soil, or natural thrift, until we are some hundreds of feet above the Gulf. The French had a hard time to find the mouth of the Mississippi, from seaward, I mean, and a heroic courage in attempting to found a city or cities when they finally did get in. They

knew, however, what was above. La Salle had come down the other way, and the explorers well knew they were in the door to a Continent. Their settlement around here, and the development of the country, is the only creditable work the French ever performed. They are not a colonizing nation, always sighing and hoping for return to *La Belle France*, and no one can wonder, perhaps, at that. Here and in Lower Canada they 'stuck it out,' as the saying is, and in the two climatic extremes of the country. How it was done I cannot imagine."

The trip to Mobile verified my uncle's description; so did the city. From a prosperous shipping port, and great commercial city, it had become a wreck. Whole blocks with low brick buildings, iron shuttered, were quiet and desolate, grass in the streets, the wharves rotten, and the great, sullen, muddy Alabama River crawling by. Now and then an ill-rigged vessel loaded with pitch pine boards, perhaps some barrels of rosin, and some cotton from the interior, but not much.

Formerly it was a nigger to a bale, or a bale to the nigger, now it is a bale to the farm with the "nigger" thrown in. There are cotton "patches," perhaps plantations, but not seen from the railway, the nigger "patch" is the rule. "There seems to be something the matter with this country," said I to my uncle, "things do not look right. It should be prosperous, and will be, perhaps, some time, but just now there is a kind of spell over it."

"Yes, Tech, you are right that far, but don't attempt to analyze the matter. It involves sentiment, roguery, philosophy, biology, sociology and history, with a smattering of thievery thrown in. Slavery is at the

bottom, not as a cause direct, but as a circumstance, one may say. Do you know what slavery is? In the abstract it is an inequality of human rights, but is not an inequality of conditions. A negro may be a slave, and more free than the man who owns him. Anti-slavery is a sentiment, often an illogical one. In one sense, and a strong sense, a soldier or sailor is a slave, so is the dependent man, and so are all men in the degree to which they must conform to the rules and laws of society.

“Southern slavery, regulated by humane laws, as it might have been, and its worst features left to expire, as they would have done in time, would have been much better than a war that destroyed 350,000 men, gave the negroes a vote and a ‘Freedman’s Bureau.’ It takes a great deal of slavery to balance a very little war, and not very much statesmanship to avoid both.

“Note these telegraph poles all leaning inward, or toward the direction of strain. The Cincinnati Southern Railway was the first and almost the only line that set poles in that manner; others set them to lean backward, away from the strain. Naturally, you would say, but wrong. When you drive a stake to sustain strain always lean it toward the pull, not away from it, as ninety-nine in a hundred are driven.”

The last proposition was a new one to me, and when my uncle went on to make a sketch and show me how by leaning the poles as seemed the wrong way the fulcra were obviously strengthened. Compression, or down strain at the top, and upward strain at the bottom. It is perfectly simple, only common sense.

It happened to be Sunday, and fortunately, too, because we saw the “blackbird” element to the best ad-

vantage. At each station, perched on fences, or sitting on logs or benches, were rows of negroes in their holiday attire. Little cotton "patches" right and left, then hills, and a beautiful country, hundreds of miles across, finally Birmingham, Alabama, where a sale of lots was going on, and people paying money in thousands that would not in their time come back in hundreds even. The "boom" idea, an insane kind of speculation, not based on reason, facts, or even common sense, born of a state of mind common to these people, isolated in trade, religion and politics. I heard two corner lots knocked down at \$3,000 apiece that it is quite sure are not worth \$300 now, and were not then by any logical reasoning that could be arrived at.

In time we passed through Cincinnati, Pittsburgh, Philadelphia and New York, the notebook worn, well filled, except room for a summary by my uncle, whose observations were not like mine, of the present only, but of the past as well.

"Tech," said he, "a man is a creation of his environment, so are his works. A sparse population is provincial, and must be so, also is diversified, a mixture, so to speak. One time I saw in Kentucky a flywheel bored with a sweep turned by a negro. They had a cast-iron boring bar passing through two floors of the building. Wooden bearings were made by bolting blocks against the floor beams. The bar extended about three feet above the upper floor, had a sweep of wood clamped on the upper end. The bar was suspended vertically by a screw-threaded rod extending up to the third floor, fitted with turnbuckles to raise the bar for feeding. The flywheel was laid on the lower floor, and 'trammed' by the bar, a cutter was wedged into a slot,

two negroes turned the sweep, another worked the turn-buckle, and a white man watched the operation. The wheel was bored in half a day at an expense of not more than three dollars, with tools not worth twenty-five dollars in all, and was bored true.

“Twenty miles away at Cincinnati (the wheel boring was done in Maysville, Kentucky), there were being made steam fire engines, also some very creditable work on mathematical instruments. That is what I call diversity, the crude and capable in close relation. It is just so in other things. All kinds of men and all kinds of ideas come together in the western country. Madame Trollope, Anthony Trollope’s mother, lived in Cincinnati then; a Dr. Mussey there was one of the foremost surgeons, so were other doctors then famous. Tosso, who lived across the river, was a famous Italian violinist and musician. Elbowing these people were the Indians, the unspeakable cornercracker, the blasphemous flat boatmen. No such medley ever met in the Eastern States. Colonel Carter of Cartersville, pronounced ‘Catah’ of ‘Catahville,’ in Kentucky, sometimes met psalm-singing Hezekiah Hickings, of Salem, Mass. John Murrel, professional murderer, of Mississippi, preached the gospel when there were no rich victims, but this section, now the middle of the country, while it had diversity at the time of its making up, had what the extreme West never did, that is, the honest and industrious farmer with as much land as he could use, and no more.

“Illinois was the first to experience modern methods. A railway grant took a great swath right down through the middle of the State, thousand acre farms began to appear, the ‘boomer,’ too, came, but he was a mild

specimen compared to his counterpart of our time. He got up towns, marked out theaters, court houses, exchanges, churches, and all that on paper, but the people pressed in so hard that the boomers' schemes were actually carried out, at least materialized as the spiritualists say, to an extent that a man of thirty who bought town lots, when fifty years of age saw his money come back again.

"There were no gold mines, no fruit culture at \$300 an acre of product, and \$900 for the land, no manufactures that were to pay 200 per cent. a year, but only farming and cattle, so the boomer was curbed in resources, his fancy could not roam beyond 100 bushels of corn to the acre, and a railway on two sides of each farm.

"At the Missouri things began to change rapidly, and from there on to the Pacific Ocean the settlement and development of the country followed a different plan, but this we will see some time, health and opportunity permitting. I want some salt-water service now, and will not expect an attack of land fever for some time to come. When I do I will come ashore on the other side of the continent. This railway travel I don't like."

My uncle never forgot and never changed his plans. "Do not drift with circumstances," he would say, "anchor or sail," and this he did. When he mentioned the Pacific Coast the thing was done, and now for some long months in the "works," self denial and hard work, but after all the next most attractive thing to roaming with my worthy uncle.

CHAPTER XXIV.

ON THE PACIFIC COAST—TALKING SVENSK—MOVING A
COUNTRY—CANADIAN PACIFIC—VANCOUVER—
HOW CLIMATES ARE MADE.

—————A year and a half gone I found lying at the back of my draughting board one morning a letter bearing the well-known chirography of my uncle, a foreign stamp, evidences of wear, and bulky for a letter of his. It was from Southampton, England, and ran thus, omitting the head:

“We go out to the west coast of America from here; to Vancouver. The ship is there to be turned over to new owners, and I am going ashore, north if alone, south if you will bring that everlasting notebook and join me. We go through the Straits, and fifty days from now should be in Burrards Inlet, they call it (outlet it should be) for the Fraser River, but geography aside the point is high enough to start from. Write me at Vancouver.”

The bulk was made up of a map. I counted off the degrees of longitude, and was appalled at the distances, but here of all other trips was the one desired, and decision did not lag. The notebook was looked up, other preparations made, four long weeks, and off. Here is the first note:

—————I wanted a look at St. Paul and St. Anthony again, and went there, then turned off at a right angle to Winnipeg, and on the way there saw the wheat country and Scandinavians.

They elect Norse congressmen somewhere up in this region, and should, I think, have several if fairly rep-

resented. Half or more of the population bore the impress of "Scandia" in appearance and tongue, speaking the strange idiom which no one except Bill Nye ever learned to imitate. Here for a divergence, let it be written that the nearer the analogy between two tongues the more difficult it is to learn both. A Russian may ask you to put from two to four v's in front of a word, v-v-v-vitch for example, and after a struggle or two it is done completely, just as the Russian did it.

A German may ask you to spell horse with a *p* and an *f* together, *pferde*. You do it with a trial or two, and can ever after in good German, but let a Chinaman give you a pair of his monosyllabic words that sound like *chi ching*, and a hundred trials floors you. The gentle Swede tells you his language is *lätt at lära*, "light to learn," which is nearly English, and you can set that down to begin with. It seems simple, but it is not. The cadence, inflection, modulation, or whatever it may be called, is impossible. A thousand elusive attempts will do no good, a breath betrays you. It is just like music, in fact a musician learns such sounds much easier. I do not mean the language is musical, although that might be said of the Swedish branch. It is a curious indescribable sound, ten times as difficult to learn as a pile of consonants in Polish.

—These Scandinavians go up there into Dakota to raise wheat. They also raise the soil, and ship it off by rail. While this thin or thick layer of loam was made, throughout many centuries as a buffalo pasture, these animals remove nothing. Their manure, carcasses, horns and hoofs remained on or in the ground. So with all vegetable growth, nothing was taken away, but now wheat is grown. The grain is sent away, the

straw is burned, or sent away also. All animal growth is sent away, and the essential elements of the soil goes along. In twenty years more the whole top will be gone, the people, too, unless they are buried here. It will, like the tobacco districts in Eastern Virginia, require a century of rest. The country "seems" all right just now, but it is not, or at least will not be long.

Winnipeg, Red River of the North, first post of the Hudson Bay Company and the Canadian Pacific Railway, are found after a long ride over a ramshackle railway, with an interlude of customs inspection of baggage—an intolerable nuisance. This straggling town of Winnipeg betokens in various ways its perennial or half yearly business. It is of the hibernating class. In the winter the streets are paved with ice, and the country clothed in snow, the thermometer hovering about zero, sometimes there, but oftener far below, away down to thirty or even forty minus.

The Canadian Pacific Railway is mainly on the American system, with some features of the British, and so far as I can see is by far the best of the trans-continental routes. It is a complete line for one thing, under one management from the Gulf of St. Lawrence to Puget Sound. There are not many differences from the American lines of the best class, in so far as machinery, carriages, and so on, if we compare with the best lines, but there is a good deal of difference in what the naval folks call the "personnel."

I had just got settled into a comfortable seat in a glass-lined smoking room at Winnipeg, when an official of the porter class halted in front of me, and after a military salute delivered the following address: "Sir, I am to inform you that among your baggage there is a roll of

wraps with a cane and umbrella in the middle that can be drawn out; the company cannot be responsible for these, but will carry them at your risk, or I will remove and bring them in here to be placed at your own risk."

Behind the train at night we could see at all times lights moving on the line, and for explanation we were informed that a patrol went over the road every time a train passed, night or day. The line is built on an embankment from four to five feet high across all plains, hundreds of miles of this, to prevent snow blockade. By the way, there is a bit of philosophy in this matter, and good philosophy too. There are no snow fences or guards, such as are seen on the lines to the southward. There is as much or more snow to contend with, but these embankments cause a break in the drift. The snow shoots over and piles up beyond, but does not stop on the railway. In the Selkirk range of mountains, where there is the same snowfall as in the Sierra Mountains, the line is kept clear by snow sheds and powerful plow engines that follow up and down during the time of a heavy snow.

Speaking of snow sheds, they have \$3,000,000 worth of them on this route, all in the Pacific range of mountains. They are wholly unlike those to the south, are not snow sheds at all, but "avalanche guards." The mountains are built on a different plan up here, twice as precipitous, and no one can see why the sides do not run down into the valleys. The guards consist of diverting walls in dangerous places, and in addition the sheds, which are arranged to "jump" the avalanche over the line. They have but one slope, corresponding to the mountain side, but more flat, and are made of masses

of timber, strong enough to shed earth and rocks as well as snow.

In time we came to and crossed the Columbia River, to my surprise. What it is doing away round here in this part of the world a map only will explain, and navigable too. It curves away to the north and is a better river here for steamboats than three hundred miles farther down, where it goes tumbling over rapids that defy steamboats. Then finally the Fraser River Canyon, Burrard's Inlet, Saltwater and Vancouver, B. C. There is another Vancouver in Washington, on the Columbia River, an old fortress and not much more, but here is a city, a young one, but with many of the attributes of age, or of progress rather. Thirty-five miles of streets, as many miles of water pipes, and every house in the "new town" is of brick and stone. No shanties, and none permitted. It is a theoretical town, laid down at the beginning to a definite plan, and the specifications strictly adhered to. A forest was here only nine years ago, now quays and steamer lines to China, Japan, Australia, Fiji Islands, Hawaii and all coast ports north and south.

I learned all this before my arrival, and at the Hotel Vancouver where I had the happiness to meet my uncle in good health and spirits, "getting his sea legs off," as he said.

———A look around here develops the fact that there is an old or older Vancouver half a mile away, made of wood, containing saw mills, shops and a lake or pond, communicating in some way with the bay. It is a typical timber town, one of the kind that burns up clean once in a dozen years, permitting improvements and extensions. A town built with wooden houses must

by the law of chances burn up whenever the houses are near enough together to permit a conflagration. It is the same everywhere, and old Vancouver has burned up a time or two. The new one will not burn up, it has been built as an investment by rich people, some of them English noblemen, who are stockholders in the Canadian Pacific Railroad. The revenues of this line are paid to the shareholders, and carried to a surplus account, now large enough, I was informed, to pay dividends for four years if no earnings were made in that time. I am skeptical about this, but it may be so.

—————The weather for the season was warm and comfortable; we were in the latitude of Newfoundland, about 49 north, and this subject was referred to my uncle.

“Climate,” said he, “is a water problem, the coast is what the sea makes it. Here the water is coming from the Sea of Japan, and is warm. The country is the same back to the mountains, where the wind is broken, and sent up, dissipated we may call it, takes the temperature due to a high altitude and descends again cold and frozen. Look at the New England coast, cold in winter as Greenland, and compare with Great Britain, four to six degrees north of there, with a mild climate in comparison. The Gulf Stream of warm water flows parallel to the coast up to Cape Hatteras, then diverges outward, permitting the cold water coming around from the coast of Labrador and Newfoundland to wedge inside. This chills the whole country.

“The Gulf Stream takes a course across the Atlantic Ocean, sweeps past the British Isles, touching most on Ireland, then crosses the North Sea, and switches around so as to touch Norway, not much, but enough to keep

the Dover Fjord open all winter, while four or five hundred miles south of there, in Sweden, it freezes ice six feet thick, perhaps twelve, I have seen it six.

"Climate is an accident, except as governed by altitude, and even that is not a constant cause, I mean in assumed latitudes. Of course it grows hot toward the equator, but what are these little variations of temperature when not measured by our susceptibilities, less than 200 degrees, when the range in a laboratory is about 4,000. Wrought iron melts at 3,000 degrees above zero, and mercury at 38 below. Both are metals.

"We are poor weak organisms, tender as to temperature, so is all animal life, except microbes; they will endure a range of 600 degrees, so it is said. I have no acquaintance with microbes, however, and give the facts on hearsay. The fact is, and you can set it down in your notes, that there is no kind of physical fact we deal with so blindly as that of temperature. We regard one point of the scale from zero to 100 degrees as the base, and everything else above and below as abnormal. Mercury melts at 38 degrees below zero, and water at 32 degrees above zero, and evaporates at 212. Which is the normal or natural temperature of these? We happen to live, as before said, between 0 and 100 degrees, and measure everything else accordingly."

CHAPTER XXV.

A CRACKED COUNTRY—IMAGINATIVE HISTORY—A STORM
FACTORY—EUROPEAN DRESS—A MISTAKE IN
HOPS—THE NORMAL LINE.

—————There is a strange mixture of land and sea in this country, about Puget Sound, and not only here, but all the way to Alaska. It seems that there was an oversight in the geographical make-up of this coast, there being no harbors from here to San Francisco, nearly a thousand miles down the coast, and the whole harbor accommodation that should exist, is concentrated here in the Sound.

Some recent writer says all these water-ways about the Sound are "fissures," and proves it too, by sections, profiles and words, that is, shows that the configuration is not that produced by water erosion, but by convulsions of nature, that cracked the country into fissures that filled up with water, some of them wholly, others partially.

This is a novel theory to fit over four thousand square miles of water-ways, sometimes called the American Mediterranean, and has for proof the extraordinary fact that the depth of the water is very uniformly in proportion to its width, or is just the opposite of basins or channels formed by ordinary causes. It is a curious proposition, in which the author says all this could be done in twelve thousand years.

My uncle had, as usual, been looking into the history and affairs of the country up here, and gave me quite a start in it, as follows:

“This country,” said he, “is the home of old lies. There have been more cock and bull stories told by old navigators that came around here, than belongs to any other new country. The Straits, here called San Juan De Fuca, were discovered, and the first entrance made here, about two hundred and forty-five years ago. De Fuca went home and made up a lot of lies of a highly picturesque nature.

“Among other things, the old pirate reported that he had found a northwest passage, that is, a way around the American continent, with other stories about endless gold and silver, a country of riches and rare products, an El Dorado, if his story had been true. The desire to astound other people with what one has seen or discovered is an astonishing human trait, commonly explained on the ground of the narrator’s vanity, but my opinion is that it comes from the propensity to deceive, inborn, and suppressed only by a higher civilization.

“Another old Spanish navigator, De Fonte, had been here before De Fuca, about fifty years earlier. He prepared the first edition of lies, afterwards revised and extended by De Fuca. De Fonte says he met with a Yankee skipper up here and bought from him a chart of the coast, for \$10,000, which chart was lost. This I mention as a sample of the old chap’s imagination.

“Captain Cook came up here before he was killed at the Sandwich Islands, and told about the first truth respecting the country, but his death prevented such use of his narrative as would have led to an intelligent explanation of his discoveries.

“Then came old Vancouver, who sailed up past the mouth of the Columbia River, declared there was no such a stream, but by accident he tumbled into the

Sound here, and then went to work in earnest, and surveyed the whole water line. I suspect he was a Dutchman, at any rate his methods were Hollandish. This was only a hundred years ago. Just think of it, and what a single century, the span of longest life for one person, can bring forth."

—————We went over to Victoria, a town that might be called "Metamorpho." There are 20,000 people here now; all quiet, staid, respectable citizens, and there are a good many characteristics of a British town, but there are as many people here as there were about forty years ago when there was a great "mining boom" on the Fraser River. Then thousands flocked in from California mainly, a swarming out of the placer mines there, then getting bare in that country. Then Victoria was a town of shanties and tents, whiskey, gambling, fighting and turmoil. Now it is just the opposite. A sleepy town they call it, but that is no description. It is not "sleepy," but orderly, and an exception to the rule thereabouts of struggling, noise, disorder and "progress," as it is called.

There is a tolerably large iron works here, and we were much astonished to find the very latest machine tools for plate working, such as hydraulic punches, shears and riveting machines, all of English make. A set of marine engines of about 800 horse power were nearly done, and a very creditable job in every way. There were some new things here, as one always finds in an inland or isolated works, not things to be described, but the usual "kinks" thought out and invented by men who in the cities would be employing their leisure time at a theater or beer hall.

About here begins, as my uncle says, the worst coast in the world for winter weather. "Cape Flattery," said he, "is a storm center where is hatched and sent out the storms that cross the continent and sweep down the coast to the Mexican line. Here the fog begins, and thickens to the northmost point of Alaska. The country up to Sitka may be worth something, but the rest of it nothing, unless for mineral products, and that is doubtful if the climate and other untoward circumstances are taken into account.

"There are no reasons for going to Alaska so long as there are other places open to settlers; I mean to live there. It affords a grand scenic summer trip for four months, and that is the most of it. There is fish, coal and some timber there, not to mention the poor seals that are butchered to make a stiff, uncomfortable kind of clothing, not half as good or sensible as the Chinese produce with cotton batting and cheap cloth. A seal-skin coat is to the wearer what Alaska is to the United States, a matter of ornament. In fact the core and kernel of the whole purchase are at this time two islands, St. Paul and St. George, where the seals are taken, a hundred thousand a year at these places alone."*

"Human dress," said my uncle, "is a mystery to all philosophy. The more civilized we become, the more illogical grows the method of dress. Look at our European and American ideas of the matter. Over your breast, there and up to your neck, only your underwear. The most vital part of the human organism left nearly bare to accommodate a breast pin, ornamental shirt studs and a necktie. Around the loins, the vital center of

*This was written in 1895, previous to the discovery of gold in Alaska.

the system, so to speak, there is a tolerably well-devised air pump. Lean forward and then back, and you will find a draught of cold air drawn in and expelled upward along the spine. The Latin branch of our people, many of them, wear a sash around the waist to prevent this air pumping, and enjoy accordingly immunity from lumbago and renal diseases.

“Around on your back there are two buttons. What for no one can explain, but they must be there. I could tell you if it were worth while how these buttons came there, but am ashamed to admit having wasted time to find out. Then there are stiff cylindrical hats, sharp-toed and broad-toed shoes, with much more that admits of no rational explanation, so that sealskin coats after all are not so much of an absurdity.”

—————From Victoria we went to Seattle, Tacoma and Portland, noting things on the way, and principal among these was a feverish unrest, and “schemes” of all kinds that seemed to engross public attention. Some time, not very far hence, people will wonder how little they know of what was to take place in the industrial affairs of this country. There is not a man here who will not set down and map out the future of these towns, the Sound country, and if pressed a little he will include the Pacific Coast, and even the rest of the continent in his forecast. One rule applies here as everywhere else, the native is no good judge of his own country. The passing stranger is your best prophet if he be qualified as a prophet at all, and as we are strangers some prophecy is in order. It may not be a good prophecy, but it is cheap.

In the first place this Sound country having respect to its natural conditions will become one of diversified

and normal industry, much more so than any other part of the Pacific Coast. There is good land, a mild climate, plenty of timber, water and coal, a mixed population, a free intercourse with the world. It is a rich country, capable of thrift, and there will be no tendency to special industries. All will flourish, and happily so, because a manufacturing, cotton, sugar or fruit-growing country, however natural or necessary, is by no means so desirable as one of diversified industries and products.

They raise hops up here, and at a profit, but not a great profit now. About ten years ago there was a failure of the hop crop in Europe and all over the world, indeed, except on this coast. The price went up to a fabulous rate, more than a dollar a pound and the hop growers found themselves rich by accident. Not one in ten of them knew what to do with the money they got, and set out to use it in various ways that led to their ruin. One old German, who had enough hops to bring \$50,000, said: "What does a Dutchman like me want mit fifty thousand tollars? Tat will shpoil any Dutchman, and ruins ter hop pisness, you mind that now." This turned out true. The brewers could not buy hops at the price, hunted up substitutes, and quit using hops to this day, but this was not all. Every one all over the country who had land planted hops, and the next summer the price would not pay for picking.

This story, related by a traveler, amused my uncle, who saw in the circumstance a text for one of his sermons, thus set down in my book:

"All human affairs move on a horizontal line, perhaps not a horizontal one, but ascending or descending, regularly, however, and wherever prices, or anything else, is pressed above this line the same thing must

descend equally below to fill out the diagram, so to call it. The space above and below the normal line must be the same. Now this applies to everything of an economic nature, as well as the price of hops. If one man, or a number of men, get very rich, that is, rise above the line in wealth, a corresponding volume of the population must go below the line. One man above, if he is very rich, may send hundreds below, and if hops go up to one dollar a pound, or eight times their true worth, call it eight points above the line, then they must sink eight points below, not, in one year, perhaps, but in a reasonable time. It is a law of nature, and, as I said, is not confined to hops. We see this law at work even in education. In countries where the most learned men have flourished there is a corresponding number below the line.

“The tendency of all natural laws is to equality, and the penalty for divergence is found in this balancing-up process. Two years ago we had attained a culminating point in speculation, extravagance and fictitious values, and began levelling up by sending many products, as well as innumerable firms and persons, below the line. There is no rest anywhere, and blessed little common sense in this struggle for existence. The broad signs of coming disaster are not learned or heeded. We are children in such knowledge, and stupid children at that.”

CHAPTER XXVI.

MACHINE TOOL MAKERS—FLEXIBLE DRILLING MACHINES—
GRINDSTONE FRAMES—BALANCING MANDRELS—
AN IDEA IN SALT CELLARS.

—————At Seattle, Tacoma and Portland we went into various machine works, and as this is a field of especial interest to myself, I propose to fill up a section of the note-book with what was seen, and the impressions gained, especially the latter. It is a tolerably risky matter to criticise shop manipulation, because there are various ways of doing almost everything, and the best way is often a matter of opinion, determinable only by wide experience and observation.

The most unprogressive among all kinds of machine work is machine tool making. It is the branch to which is directed the highest skill, and in all countries is the field of the best mechanics, but for some reason tool makers come the farthest from logical conclusions of any class engaged in the machine business. There is about as much science in their art as there is in making worm fences in Virginia. They don't even know, and will not attempt to find out, the strains that occur in metal cutting, and of course never compute sections to resist strains, unless it be in a press or like machine. A lathe spindle may be two, three or four inches in diameter, and drilling spindles the same. This last mention brings up a particular point, noticeable in nearly all drilling machines, that of "torsional elasticity."

If a drilling machine is employed for boring, as is common in this Western country, its operative function is not much different from the head stock of an engine

lathe, but if we look at the two we see a vast difference. It would be pretty hard for a tool maker to explain why he should not put the same gearing on a drilling spindle that he does on an engine-lathe spindle, but he does nothing of the kind, in this country at least. In England the rule was formerly, and may be yet, to use the same gearing for lathes and drilling machines, introducing in the latter a pair of mitre wheels to make the angle. This was a very good rule, and saved a good deal in patterns and drawings, produced a powerful machine with the torsional elasticity confined to the mitre wheels and projecting spindle, not quite as stiff as a lathe, but near it.

Compare this with the back gearing on a second shaft, two to four feet long, and in the case of radial drilling machines on a second or third shaft, sometimes with as much as ten feet of light shafting between the power and the work. A radial or a crane-drilling machine geared in this manner with a great sole plate, a heavy gib bar and a spindle two to two and a half inches diameter is a caricature on machine design.

If one asks a question he is informed that the drilling machine is a "powerful one," powerful for what? To turn drills? For that is nearly the sole function to be performed. "Drills true" we are told. How drills true? A machine does not guide its drills. The drills guide themselves, and if there is a deviation the machine multiplies the error, and makes it worse. Of course the work and spindle supports must be so sustained as to withstand the thrust of drilling, that is, the framing must not bend or yield, but as to lateral stability or guidance, these elements or functions are not provided by the machine at all.

Let us consider a drill itself as an implement. It has two short cutting edges balanced across its point or axis. These cutting edges are guided by four agencies: the burrowing point, the bearing of the edges themselves, the lateral fit of the drill in the hole and the support of the outer end by the drilling spindle.

Now among these elements of "guidance" what does the machine itself provide? It holds the outer end of the drill central with the hole "as it was started," presses it forward, and nothing more. If the drill deviates this support causes more deviation, as we can see in ratchet drilling. It is a blind following of the course. There is, however, another machine function, that of starting drills at a right angle to the plane of the table, convenient, and hence important, but with all allowances it is easy to see that a "powerful drilling machine" is an idea, not a fact, except as to force of revolution.

—————This divergence to drilling has used up about ten times the intended space, and we pass to grindstones. These I find mostly in wooden boxes or troughs, that by the nature of the material must be made of angular section, but some of the frames are made of iron, and have on the side the name of a notable firm of tool makers, but the form in this case is circular or semi-circular to fit around the stone. What for? This shape destroys the base, and this must either be expanded again, producing a new set of curves, or some kind of legs must be screwed on to get a footing. The result is a grotesque-looking soup-bowl affair that costs a good deal for pattern making, and is inconvenient to mould, handle, and awkward in use.

The "box" fits around the stone, so that if a tool falls in it will jam the stone, and cannot be got out. There is no room to catch water or hold sand, except a small pool in the center, from which the stone picks it up, and casts it out over the grinder or on the floor. Suppose that on the contrary these iron grindstone boxes were rectangular in form, ran straight down to a flange that rests on the floor, the corners affording a space to hold water and slush. Such a form would look well, and be well; I have seen them and tried them.

————— I noticed the men grinding on the approaching side of the stones, and asked the reason. "Takes the wire edge off" was the answer. That settled it. A wire edge on a metal cutting tool is good. Where I learned my trade we oil stoned the tools after grinding, which it is true took off the "wire edge," but the object was something else. The tool was smoothed just at the edge and its cutting friction reduced.

The reason that men grind in front of a stone is that there is less pressure to apply, but this is a poor compensation for being slopped all over with dirty water, and running the risk of smashed fingers or worse. So it has always been in machine shops. But observe a professional grinder and see if he works on the front, to so call it. He would not think of such a thing, even if he were grinding machine tools.

————— To stop fault finding for a time, I happened today on a little matter or expedient that went far to direct attention from tool criticism, and something so good that I felt compelled to hurry back to the hotel and submit it to my uncle. It is common, or so far as I know, the universal rule in balancing pulleys or wheels to fit them on a mandrel that fills the bore, and

then roll the mandrel on the ways, marking the high or light side. These mandrels cost a good deal and a good many are required for holes of different size. The thing I found was a man balancing pulleys with all kinds of bore on one mandrel. He would put a pulley of four inches bore on a two-inch mandrel or piece of shaft, and go on just the same. The rolling action seemed to be even more sensitive when the mandrel did not fit the hole. I was amazed, also disgusted. Here is my uncle's idea of the matter:

"There is nothing strange in this, we are all slaves of habit, with a limited power of reasoning, and are always blinded by familiarity. No one reasoned that matter out. Some lazy fellow, or some one in a hurry, stumbled on that idea when trying to scamp work. I can see how it will do as well or better even, than if the balancing shaft fitted the bore, now that you mention it, but never thought of it before in forty years' experience. It is 'leaving off,' that is, omitting parts, and is for that reason opposed to the natural idea or tendency which is to add on something, but the matter is not done yet. You have it down in your note-book, in your head and in mine, but there are by the census report about sixty million, nine hundred thousand, nine hundred and ninety-seven people left to learn it. How long do you think it will take for this to go around? Go back to that shop in five years from now, and you will perhaps find them carefully turning up special mandrels to fit the bore of each pulley or wheel to be balanced. It may require a pick to get a joke into a Scotchman's head, but it requires a pile driver to penetrate the crust of custom.

"Please hand me that salt cellar? I want to use it for an illustration. It is a shaking one, and inside is a

small battering ram to pulverize and loosen the salt, but even with that you cannot shake out any. It is caked hard, and from here to New York you will not find one much better. Salt absorbs moisture, and melts to the extent of the particles adhering together, "packing" we call it. Now what is the logical preventative for this? Obviously some substance to take up the moisture, starch for example. Put twenty per cent of starch in the salt, and it will flow like sand or gunpowder in all weathers. Do you think that is new? Not by any means, every fool should know this much, and hundreds, perhaps thousands, have been informed of it, but it remains in the occult field of the unknowable for all the rest. Now you can discern what is to become of your balancing mandrel problem."

This was hard, this ruthless theory of my uncle, but it is true, and brings to mind the Hero engine of 300 B. C., just now in a modified form coming to the front as a motive machine, but there are exceptions, not in the useful arts unhappily. If the beaux on the boulevard in Paris put on square-toed boots, they will appear in Halifax and Sitka by course of mail. If hats have an inch added to their brim diameter, or as much taken off, the change goes directly around the world, and all imitate the fashion. It is only useful things that travel so slow.

————— I wonder what the reason may be why line shafting all over this country, so far as we have seen, is coupled with keyed-on flanges, not even clamp couplings. I brought up the subject once or twice, and in answer to inquiry brought out a discussion of the merits, cost, and holding power of compression and flange couplings, but no hint whatever that would show

that people about here know what compression or clamp couplings "are for." This is just a little strange, when one finds, on the other hand, any number of ingenious expedients invented and applied to all kinds of purposes. No one, however, seems to have discovered that clamp couplings convert the making of line shafting to a "manufacture," and this is the key to any system of cheap production; but then, organized manufacture of any kind is in its germ state here, and must be for some time to come. There is no market to permit duplication, and here is the greatest impediment to local production. I am expecting to find other impediments before we get to San Diego, or the Mexican line, but there is one quality that goes far to compensate for organized industry, and that is a restless vigor and boldness that makes one man count for two in some other parts of this country.

CHAPTER XXVII.

BRAHMANISM—A HIGH COUNTRY—SOMETHING ABOUT
MIRACLES—HYPNOTISM—A NOVEL TYPE OF STEAM-
BOATS—IMPROVING A RIVER.

—————At the hotel in Tacoma we found a number of foreigners, mostly Englishmen, travelers "taking in" and doing the country, as one of them said. Among others a sedate-looking man that his companions called "Brahma," a name bestowed as we learned because of his belief in the faith of that name. To myself, no doubt to most other people, this seemed a most miraculous and heathenish idea, and I mentioned as much to my uncle. It was the greatest mistake I ever made. My

uncle I knew had been in India, and noted among other things the faith of the people there, at least he notes everything, and as religion is the most prominent feature of social life in India I might have been more cautious, and first learned his views of the Brahma matter.

"A Brahma!" said he, "what of that? What do you and the rest who are quizzing this man know of Bramanism? When Egypt was young, a thousand years before Greece and Rome, these people had progressed farther in the study of the human mind and being than any other people have to this day. The center of Brahman faith is in Thibet, where no one goes, and no one can go, to stay at least. It lies 14,000 feet above the sea, and demands physical and anatomical conditions that came of evolution, lungs to hold twice as much air for one thing. A few people, perhaps not a dozen in all, of our race have penetrated this country, and not one person in a million of them knows what Brahmanism means.

"As I said, five thousand years ago Hindoo philosophers had progressed farther in fundamental knowledge than we have to-day. Their country was covered with fine cities, canals, reservoirs, terraced gardens, temples and palaces, so graceful and beautiful that the best we can do now is to make imitations of them. They had little scientific knowledge, and so much greater becomes their achievements, especially as all these things were done without lying, cheating, murder and other concomitants of our modern civilization, at least there is no record or tradition of such vices.

"I have seen the mango seed planted in India, and in thirty minutes grow to a tree before our eyes. Legerdemain you call it. I have seen it, or thought I saw it. What does it mean? A power over the human mind

of which we have no knowledge except a mere fringe we call hypnotism, and that a mystery. The miracle was not performed for money, but for the same reasons that Christ performed his miracles, and was followed by a sermon that lifted the human mind far above the plane fixed by our Western sciences.

"I am not of a credulous nature, and believe in the immutability of physical laws, as any one dealing with modern science and mechanics must do, otherwise be considered a fool, but when it comes to the laws that govern the human mind, and the relations that life bears to matter, we must go to the Brahman to learn.

"The man who planted the mango tree had been doing that very same thing his whole life, so had his father and grandfather before him, so had his progenitors for thousands of years before. The mango tree is an inconsequential matter, but the power that made it grow, blossom, bear fruit, wither and disappear in sixty minutes, that is the point. The man had no clothing to exceed a dime in value; his food, a cup of rice, was not worth two cents, and these things were given to him. His business was to study the human mind, and this he had done to some purpose.

"Another man would cast a coil of rope upward in the air, where it would remain rigid; then he would climb up the rope. Don't laugh at this. Thousands of people have seen the same thing, or thought they did. There was no stage or stage apparatus, no gas light, or anything to promote deception. All was done in the open air, not for pay, as I before said, but as an experiment on the human perceptions, and now I come to the point. A people who have thus studied the human

mind and soul of man are very apt to attain to a high religion and system of morals.

“No one of you who are laughing at our friend knows what the term *Brahma* means. Neither do I. I am not advanced enough in knowledge and the powers of perception to understand it, but one thing I can explain, it does not mean a “thing,” a creed or even a condition that can be expressed in the terms of our language and modes of thought.

“Our friend is not a *Brahman*, he cannot be. He has only attained a decent respect for a wisdom of which he is conscious. He has no doubt seen jugglers in the streets of Benares. He may have been on the plains of Thibet, or even at Thibet, but let this be as it may I am sure that his reverence for Hindoo wisdom is based on some reason that does honor to his judgment and the better feelings of his nature.”

—This extraordinary sermon, here noted down imperfectly, was a revelation to me, and I lost no time in some further inquiry and reading on the subject of Hindoo faith, and conclude that if instead of technology and mechanics I had devoted as many years to mental philosophy I might be in a position to understand something of human desires, passions, senses and spiritual life as taught in Eastern philosophy, as it is I give it up.

As to Hindoo magic, as we term it, every one has read of that, and as a reality have scoffed at it, properly so, because it will not square with the laws of gravity and other fixed principles that no one can doubt, but we never think of the minds and imagination of those who are looking on.

A German traveler, Dr. Hensoldt, has recently made his way into Thibet and written of esoteric science there in a way to disturb one's mind, but this digression, covering many pages in these notes, has gone far enough, and is excusable only on the grounds that many scientific men of our day have taken up this subject of occult science in the East, and we may soon look for some rational, or at least possible, explanation of the mango trees and rigid ropes.

—————Portland, Oregon, is on the Willamette River, near its mouth, nine miles below where this river tumbles over a considerable cliff. We found here a good many interesting things, a strange mixture of the head and tail, so to speak, of industrial art. Among the head things were stern-wheel steamboats, that had some approximation to the lines and make-up of theoretical marine craft, especially below the water-line, and the fact caused both myself and my uncle a good deal of concern. In the first place the wheels were much smaller in diameter than on our Western rivers in the Mississippi Valley, not more than two-thirds as large, a fact that no one seemed to be aware of, and which is yet unexplained.

Going on board one of these steamers we found geared to one of these small wheels a pair of engines that by inference should have spun it around regardless of the water at a rate equal to a wind-wheel in a gale, but nothing of the kind took place. We made a short journey in that same boat, up to the Cascades, about six hours' run, and the little wheel hung to the water like the rack pinion under a mountain locomotive, and there was no slip.

The engineer said it was the form of the hull that had a clean "run" and left solid water at the stern for the wheel to work in, which seemed a contradiction, because a bluff flat-bottomed barge, like on the Mississippi hulls, leaves a following wake, dragged against the wheel, so it seems at least, but this will not do, because here is ocular proof of the contrary, and the undisturbed water theory must stand for the present.

The engines were the best I had ever seen on a "wheel barrow" steamer, were well managed and pushing along a boat to carry 800 tons of freight, eighteen miles an hour, with a cord of wood for fuel in that distance. One boiler, a huge firebox one, set amidships. The whole thing was a revelation in stern-wheel boats, and deserves a dozen pages here if I knew how to write them.

The Cascades are well named, and make a complete bar to navigation. The Government in a kind of desultory way is making sluices at the head of the rapids, and will be for many years to come,* but how a boat is to get to these sluices or locks up over half a mile of rapids, or go down over them, is a problem in "occult science." There will be a canal, no doubt, but there will be time enough to think of this in the remote future.

In a government of and for railways, the improvement of waterways is a kind of sham set up to catch opinions and votes. It is like dredging out the channel to Galveston harbor, and letting out there the products of the Southwest that are now carried by railways to Eastern ports. It is not likely that any one now living

*This work was finished about three years later.

will see a channel to admit ocean steamers to Galveston, and may never see steamboats going up over the Cascades and Dalles. The latter are other rapids farther up. This would be direct interference with railway interests, and not to be tolerated. This idea is my own.

CHAPTER XXVIII.

POPULATION WANTED—THE LEAD-PIPE CINCH—PIONEERING—A NEW-MADE COUNTRY—A MAN FROM BOLIVAR.

—————Before going farther down the Pacific Coast one may observe here fully the nature and trend of what we may call the local civilization, not that this term applies to what is meant, but there is no other at hand. The keynote is found in two things—immigration and imitation.

There is continual effort to imitate the Eastern States in a country where climate, products and other natural conditions are different. There is, of course, a good deal that is original, but the latter is forced and not induced. This is natural, from the maintenance of highways and schools down to the hitch of a harness, but the immigration matter is not so easily accounted for.

In San Francisco we are informed there are regular societies to promote immigration, and one can hardly run over a serial publication of any kind here without finding something about "more people on the Coast." This may be a desirable thing, but I think not. People have come here much too fast as it is, long before there were means to employ, regulate and govern them, and while much of the required machinery of population

was wanting. This remark need not, however, be confined to the Pacific Coast. It is common all over the country, and one may ask for some logical explanation without ever receiving anything of the kind.

Population is not strength, unless made up of "solid men." The imported thousands that come from Europe and Asia, with other thousands that are bred up to ideas engendered by this immigration, in politics for example, are no gain to a people, and I believe that if the population of the United States had not increased a single soul in twenty-five years past the country would be in a much better condition than it now is. As this has no hope of proof it is given for what it is worth as an opinion, an honest one at that, but the query is, where did this craze for population come from, and what is its incentive?

With this cry for people has come about circumstances that repel nearly all except the dependent classes. One result is the difficulty and almost impossibility of operating with small capital, or by individual effort. It takes a "company" to do anything, and the company must be rid of competition if possible. A droll kind of a man we met as a fellow-traveler had studied these circumstances, or rather had discovered them. Here are some of his remarks as near as they can be remembered:

———"People about here when they do business want a 'lead-pipe cinch' on what they are about, and they get it, not by monopoly always, but in another way. When a poor man, or any one man, starts a business he must put up the capital, and must meet the assessor when he comes around. He may make ten per cent. a year, perhaps more, and a company must do the same, but does the company put up capital? not much;

they just figure it out. What money they have is borrowed on the bond dodge. The shares represent nothing, or a good deal less, except to swell the investment account. This is financiering, and to divide ten per cent. on the watered stock fifty per cent. must be earned on the real capital, hence there must be a 'cinch' somewhere, some kind of charter, privilege or right, which one man cannot command. The small man must be kept out of the way, and he is smashed somehow, hence our enterprises are large, large in many ways, and a poor man has only the privilege of wages, and not that in many cases."

The "lead-pipe cinch" was a curious but expressive phrase, and describes perhaps too strong an idea of business that has grown out of the speculative era here, and is the bane of this country, as well as a good deal of the Eastern part. It was well illustrated by a stove-maker we called on:

"I did pretty well," said he, "until they scooped me with capital. I was in the way, and they just shelved me. All I own here is my clothes. The store across the way has my foundry. Money is dear here and I did not have much capital, so could not sell on credit, but the merchants use credit where money is plenty and cheap. A stove foundry in Troy, New York, can borrow money at half what I can. Their agents here take farmers' notes for twelve months for stoves, and send the notes East as collateral, or sell as an investment. They soon scooped me."

I submitted the droll man's notes to my uncle, who I found had been already carefully observing the same matter. "Tech," said he, "that notebook of yours is of no use in the present case. You might as well try

to dock a ship in a wash tub. It will require some reams of paper to deal with this matter. You have struck the great economic problem of our time, coming like an avalanche, and you can only look and wait to see what turns up next.

“The ‘lead-pipe cinch’ is no myth. It is a fact, and has another name, invented by Mr. Gladstone, who calls it an ‘inequality of human conditions.’ Where population is fixed, or nearly so, and where the opportunities of nature are watched and held in some equitable way, the inequality is not so marked, but as you go toward the edge, where things are new, prices unfixed, and the opportunities of nature are exposed to personal or corporate conquest, there you will see the ‘lead-pipe cinch,’ as your friend called it, also will find the struggle for existence intensified. Markets are narrow, population not assimilated, the sentiment of sympathy is weak, and people act like a multitude floundering in the water, each one trying to keep afloat by pushing the next man under. Laws are weak, or not enforced, and the race is exemplified by the ‘devil take the hindmost.’

“Better end this topic right where it is in your notes, and make a cut-off line: ‘If you want to be contented, fairly treated and happy, never live where the population of a country is rapidly increasing; keep to where there are sidewalks, gaslights, good roads and a fixed population, and let others do the pioneering business. They are fond of it, crazy for it indeed, and there is no lack of recruits.’ ”

I took his advice in so far as the present, but hope to learn more of this lead-pipe cinch matter before we get through. This “inequality of human conditions” is a striking name and theme.

—————The making of railways up and down this coast calls for fortitude, and might well excuse a little water in the shares. As, however, any ideas set down here belong to my uncle, it is but fair to transcribe his remarks on the subject.

“This country,” said he, “is wholly unlike the Atlantic Coast. That is flattened out, settled down, and was finished thousands of years before this job began. It is all volcanic here and to the south, increasing as we go on, that is, more recent, and the whole structure is as if it had been shook up when hot and set down to cool. You don’t see much surface evidence here in Oregon. It is a little older, but wait until you get to the Bay of San Francisco and thereabout, and you may run through miles of lava that has not been disintegrated enough to form a skin of soil. Some places you will imagine yourself passing over an old furnace dump. There is scoria, puma and a lot of other matter with Latin names that we common people call slag when it comes from a furnace. There are whole counties of it in California, some of them not very well settled yet, because it is not long since some of these volcanic centers were shaken out of semblance.

“Up here there is a good deep surface strata, as the dense timber growth proves, but pretty soon you will see no more of this dense timber growth, except in valleys where the detritus has made depth enough. To build a railway here is a job, of course, and there is not only the physical impediments to construction, but the useful surface or area to be served is limited in the same proportion.

“They do not need railways up and down this coast in such places as from San Francisco to Portland and

Puget Sound. Nothing but an inadequate and law-harassed sea service permitted it. There is no finer chance in the world for a coast steamer service that railways could not touch, but it does not exist. The vessels are just large enough to induce seasickness, and long enough at sea to make it aggravating. A steamer should be at sea only thirty hours or so between Portland and San Francisco, and if of the first class, and large enough, very few would patronize a railway train that is nearly as long on the way.

“Watch these valleys, or, what is better, look at your maps, and you will see that instead of leading to the ocean the common course is parallel to the coast, another sequence of volcanic architecture. Look at the great valley of California, stretching 400 miles parallel to the coast, the high ridges, with a lava cap hundreds of feet thick on top, and buried stream beds beneath where the miners delve and tunnel for gold. It is a queer country geologically, and in a good many other respects.”

—————We went down the coast by train, not by choice as a means of travel, but to see the country, and were much interested in various things on the route, especially when we passed Shasta, a snow-capped mountain, and descended into the valley of the Sacramento River.

The transition from the fir belt, just below the snow, down to a tropical country in a few hours' run was amazing. As, however, this change is due less to altitude than the effect of winds and sea influences, the two things must be kept in mind. Get behind a mountain here, and you can plant figs and oranges. Go on the other side and none of this. Twisted trees and chapar-

ral, cold too, and dried out in summer. I have seen somewhere a weather table made up from observations under the lee of a mountain 2,500 feet high, only ten miles from San Francisco and five miles from the sea, that corresponds to climate 500 miles south of there. The rainfall was double on the lee side of the mountain.

—————The Sacramento River occupies or runs through a wide valley, draining hundreds of square miles of alluvial lands fertile in a high degree, and so dear in price we are informed that when bought at this day will not return taxes and interest, not an unusual matter here, however, in investments, because the real facts of production are too irregular to be estimated. People proceed on the assumption of maximum crops and high prices.

Wheat, the principal product, is measured by the cental of 100 pounds, which is sensible. In ten years its value has gone down from 1.75 to 1 cent a pound, or 60 per cent. In this disappeared all the profit, and with it some of the cost of production, as it is figured or as it really is here. Wheat from being a surplus product of farmers has become here and elsewhere in large wheat-growing districts a "manufacture," conducted with and having all the characteristics of "company" operation, consequently without that element that founds and cements a community of farmers' homes and villages. In this matter we met with what is the great and controlling characteristic of this portion of the Pacific Coast, and discovered it at first from a fellow-passenger who lives in a Sacramento Valley village. I have his words set down very nearly as delivered, except the name of the town, which is changed.

"I live in Bolivar, or what was Bolivar, in the valley. It was a kind of mixed town, a little farming, gardening, stock raising, blacksmithing, wagon and harness making, cooper shops, shoe making and the like. A main road from the foothill mines passed through the town, and the tavern did a great business. Every man was at work. There was plenty to eat and wear; money too; churches, school and all this, but it ended. Rich men we had never seen got the land all around and made it into great farms. The railway built a branch through our main street. People came from the City, and set up two great stores, one for the men and one for the women.

"A ramshackle train carrying people, merchandise and cattle came once a day crawling through, and charged ten cents a mile to travel in a box car, and for freight more than the wagons got twenty years ago. The shoemaker, blacksmith, cooper, and carpenter shut up their shops. Rich men's sons from the large farms make the town their evening resort. Bars, beer halls, game houses and the like sprang up, and Bolivar is the wretchedest place you can find. Not one man in ten works. There is nothing to do but to loaf around. No one builds a house, no one has any money, and what is wanting is a big fire, and then a wheat field on the ground where Bolivar stands."

This was undoubtedly what is called here a mining town. They rise and fall with the mines.

—————We are at the metropolis of the Pacific Coast, a veritable city "set on hills," not high ones, but enough for drainage and to furnish an incentive to invent cable railways, that widely spread over the world from here.

One of these hills near amidships, offered a view over nearly all, but the best view of the physical environments of San Francisco is obtained from an eminence 700 feet high on the Marin County shore, north of the Golden Gate, or harbor entrance that bears this auriferous name.

There is no city on the American continent that presents such a problem as this one. Nature by various means has made it the metropolis and more than this, the "entrepot" for a shore 1,200 miles long, and has obligingly neglected to indent the coast or otherwise form a harbor capable of great commerce throughout all this distance, except at San Francisco; but here has created an inland sea with a coast line 500 miles long, surrounded by capes, channels, creeks and all kinds of shelter and other provisions down to fresh water in the northeast portion that stops the teredo from eating up, or down, the wharfs.

I think it was the Hon. William Seward who once made a journey up along this coast and prophesied that it would some time contain a mass of people, wealth and activity, outrivalling the eastern side of the United States.

There is much to warrant such a prediction. I might fill here a dozen pages with reasons for such an assumption, just as good prophecy as any one can make and the subject would be new, because the future of this coast, and especially of San Francisco, does not seem to concern the present generation even hereabout.

The city by a little sea trade, a little zone of internal traffic, mining interests, some manufacturing and engineering work, has struggled up in forty years to about 320,000 population. Mr. Potter's census of 1890 not

being ready yet and of little use when it is ready, I guess at this estimate.*

This city is the western door of the United States through which by all natural and trade laws must sometime flow outward and inward, the main foreign commerce of the United States. In support of this idea I will turn back in my note-book to a little screed on this subject, by my uncle, delivered in a different connection, concerning foreign trading.

Said he: "We cannot trade to Europe except in natural products that grow here and will not grow there, or for which there is no room there. People of like power and similar civilization have no true basis for trade. Skill is portable, so is knowledge of all kinds of industry. To send our skilled products to Europe is like sending coals to Newcastle. The natural markets of San Francisco lie in South and Central America and in Asia. The trade of India for two thousand years proved the truth of this. Venice, Rome, Constantinople, London, Paris and Vienna were all built up by the trade of India. It was a golden stream that flowed in different directions in different ages, directed by wars and the circumstances of trade. Europe does not want anything from here except food, crude minerals, or other natural products, with now and then an invention or product of invention that is imitated there in a short time."

This applies to our present subject of San Francisco. The people here do not realize or comprehend what they have in keeping, or their future destiny. They are mostly people who have come out from "home" in the

*Written in 1898.

Eastern States, turn their backs to the ocean and look back inland for letters and mercantile supplies bought from their old friends. There is no grasp of the real situation. It is no wonder that energy and almost hope have been drubbed out of them by various paternal laws, State and Federal, that promote the idea of a "town on the border," also by especially active corporate interests that seem to control everything.

One of the best informed men we have met said "San Francisco is not a seaport, it does not lie upon or touch the sea. Vessels land in another jurisdiction and their cargoes to and from are carried across a narrow strip of State land between the city and the sea, the vessels paying toll for the privilege of landing and lying opposite San Francisco and it is good luck that the General Government controls the navigable rivers and bays, otherwise that privilege would be bartered or given away. The connection with sea commerce, in so far as regulation or control, mainly consists in taxing vessels with municipal dues. It is a fine scheme, this taxing of property in another jurisdiction. It beats the old New Jersey taxes on the Camden and Amboy lines across that State, which gave it the name of being a foreign country, but it will not work here the same way. The ship owners shift their vessels over to some other flag and country for registry. Think of an American line of steamers sailing under the flag of the Hawaiian Islands!"

This, and other things said, led to considerable light on this great city, its policy, future mission and present status. It represents a cubic foot of destiny and possibilities crowded into a quart pot of enterprise; but I must get down to practical matters of the present time.

San Francisco is afflicted with a numerous population not wanted elsewhere, patriotic people who leave their country for the country's good; honest, many of them, but of no use. They come out to this country to "pick up chances." A stranger is looked upon with distrust. The common sentiment is "What does this fellow want out here, unless he be a 'one lunger' looking for climate? What is his game?"

No one can wonder at this feeling. It is not born of prejudice or of innate faculty. It is only a reflex of facts. This coast is the resort of incapable persons who come out here to pioneer among an unsophisticated people as they think, but as our friend quoted above said, "Lord, how they get fooled!"

My uncle has made a preliminary tour among the machine shops and his remarks explain pretty well what was meant by the phrase quoted above.

"I have been around the world a great deal," said he, "and have seen all kinds of machine works and other factories, but never seen such traps for an unsuspecting stranger as I have this day."

You come across an old tumble-down shed suggesting an antiquated soap works and inside find an equipment, practice and product that is right abreast of the times.

Of course one who does not take into account the diversity and nature of the work done might make a mistake, a large one; but think of twenty draughtsmen in an old barn of a place making high class drawings of the work. What is done no one can find out. It would be a great deal easier to tell what is not made. You can go in and order a deck winch or a dredging machine, a locomotive, a line shaft, a mountain railway or mountings for a farm gate, it is all the same. As one

man said, "We make steamships, snowplows, sand scrapers, and now and then some picket fence to fill in with." I believed him.

What could an ordinary routine workman earn in a place like that? Not enough for files, waste and oil.

This aroused my interest, especially as my uncle said he had only been to some of the nearest and smaller works.

One thing is evident, that this is the toughest case we have met with so far. The city, its connections, possible future and present being are problems with no answer in sight at this time.

It takes time to think and more time to derive even vague inferences. It is a center with natural lines of trade reaching into Asia, the Pacific Islands, the South and Central American States and to an interior country which is little more than a problem at this time, filled with mines and diverse mineral products, timber of a wonderful kind, a culture of the land and products that are new to this country, a population of diverse nationality, some living on ten dollars and some on ten cents a day. One must sit down and think awhile, perhaps a good while.

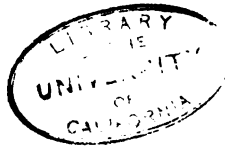
It is the most chaotic of American cities, perhaps the most chaotic in the world, if that term is to mean an absence of purpose, mixture of pursuits, a blending of culture and the reverse. There is not a thing one can see that has not some local tinge, even down to boot-blacks who have open-sided kiosks with seats about four feet high, the interior is ornamented with pictures and the daily papers are always at hand.

My uncle keeps up what the Scotch call a "deil of thinkin'," his analysis has received a heavy overload,

but he will grind it out in the end and there will not much get out of him until the grist is ground and bolted.

There was a significant remark made by him today. "Tech," said he, "we had better get out of the hotel; this is not a boarding-house town and we can live independently in lodgings the same as in Europe and at a lower rate."

This meant a stay of some time and it is agreeable.



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